HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

Editorial Staff

Editor
CLIFFORD STROCK

Associate Editors
NATHAN N. WOLPERT
WILLIAM B. FOXHALL

Advertising Staff

Western Representative
GEORGE G. TURNER
228 North La Salle Street
Chicago 1, Ill.

Eastern Representative
HARRY J. TWINE
148 Lafayette Street
New York 13, N. Y.

Pacific Coast Representative
ROBERT H. DEIBLER
2506 W. 8th Street
Los Angeles 5, Calif.

Published by

THE INDUSTRIAL PRESS
148 Lafayette Street
New York 13, N. Y.

President
ROBERT B. LUCHARS

Vice-President and Treasurer
EDGAR A. BECKER

Secretary and Publishing Manager
HAROLD L. GRAY

Subscription Rates

Yearly subscription in the United States and Canada, one year, $3; two years, $5; three years, $6; in all other countries, $5 per year. Single copies 30 cents. Entered as second-class matter, April 18, 1925, at the Post Office, New York, N. Y., under the act of March 3, 1879.

Member, Audit Bureau of Circulations.

CONTENTS FOR MAY, 1950

VOLUME 47 NUMBER 5

ARTICLES

Air Conditioning and Ventilating the Theater Projection Room 51
J. J. Seling

Building Advances Require New Review of Codes 56

Methods of Supporting Pipe—Part 1 57
J. E. York

Standard Malleable Iron Pipe Fitting Allowances 61
R. Irmiter

How to Insulate Cylindrical Ducting 64

Tailpipe Exhaust Systems for Garage Ventilation 65
M. Sheinbaum and *A. C. Stern*

CO_2 Indicator Guards Holland Tunnel 68

Damper Switches Improve Control of Dust During Grinding 81
L. Silverman

Graphical Method of Estimating Fuel Consumption for Heating 82
G. P. Jankauskas

Heat Transmission of Lightweight Aggregate Concretes 84
W. B. Foxhall

Operation of Window Air Conditioners 85

REFERENCE MATERIAL

Section—Standpipes for Fighting Fires in Multi-Story Buildings 69
M. Freund

Data Sheet—Sensible Heat Loss in Flue Gas Opposite 122

DEPARTMENTS

Washington News—*Loring F. Overman* 47

Product Applications 86

Experience is my Classroom—*T. W. Reynolds* 88

News of the Month 91

Degree-Days for March, 1950 95

New Catalogs 97

News of Equipment and Materials 99

What Readers Say 110

Getting Personal 110

Since the Last Issue 112

Industrial Degree-Days for March, 1950 118

Canadian Degree-Days for March, 1950 118

Coming Events 119

The contents of HEATING AND VENTILATING are indexed monthly by Industrial Arts Index and by Engineering Index.

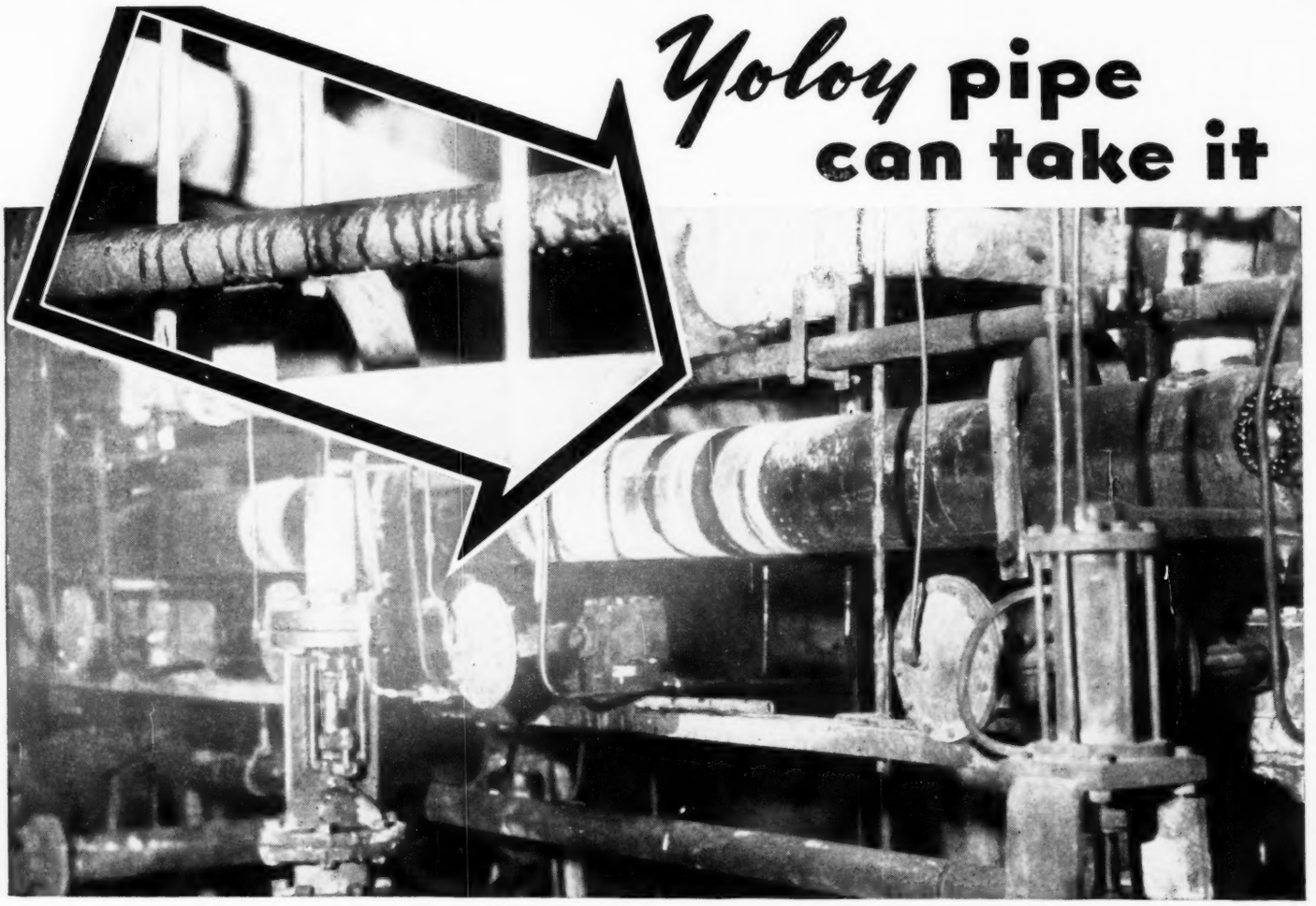
Copyright, 1950, by The Industrial Press

PUBLISHERS OF MACHINERY & MACHINERY'S HANDBOOK
The INDUSTRIAL PRESS

THIS MONTH'S COVER

The photograph showing part of the extensive piping installed at the ethyl alcohol plant of the Shell Chemical Corp., at Houston, Tex., gives an indication of the importance of the proper pipe supports. Photograph, courtesy of Shell Oil Co.

Yoloy pipe can take it



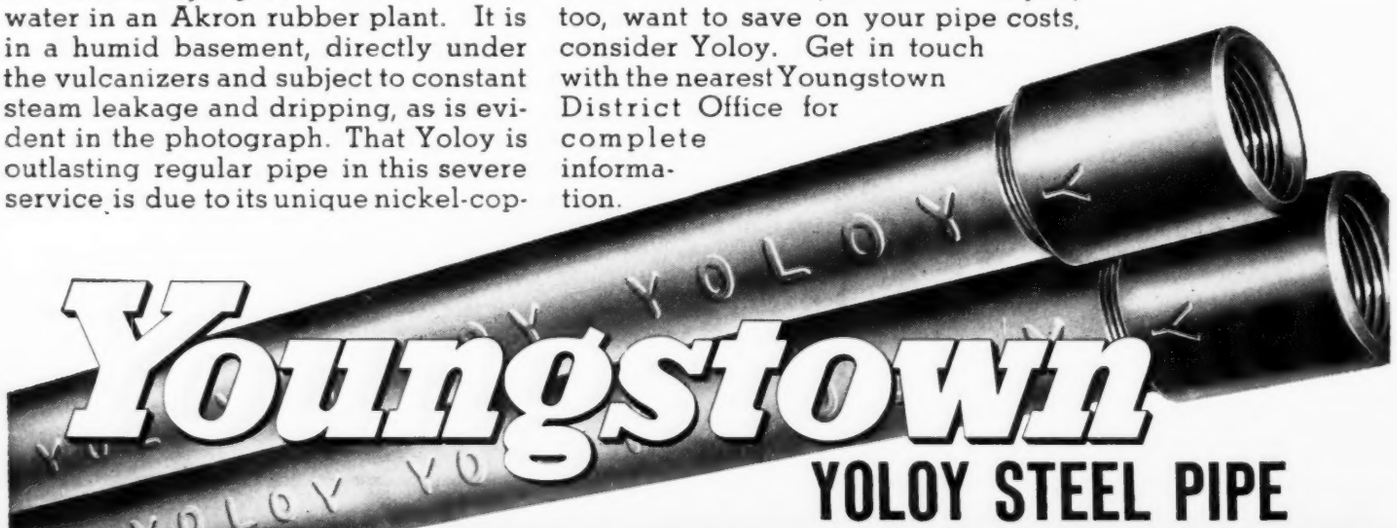
In the arrow inset above, you see a piece of 1½" Yoloy Continuous Weld Pipe. Subject to continual corrosion, it is still in use after nearly 4 years. Regular pipe used here previously had failed and been replaced at least once a year.

This Yoloy pipe is in a booster pressure line carrying 500 P.S.I. raw cold water in an Akron rubber plant. It is in a humid basement, directly under the vulcanizers and subject to constant steam leakage and dripping, as is evident in the photograph. That Yoloy is outlasting regular pipe in this severe service is due to its unique nickel-copper content or low-alloy composition.

In this installation Yoloy pipe has saved the manufacturer 50% of his pipe cost, 75% of his installation labor cost and has avoided three costly shutdowns for pipe repairs.

Yoloy standard weight black pipe is carried in stock for prompt delivery in sizes from ¾" to 3", inclusive. If you, too, want to save on your pipe costs, consider Yoloy. Get in touch with the nearest Youngstown District Office for complete information.

THE YOUNGSTOWN SHEET & TUBE CO. 1900 YOUNGSTOWN 1950 50 YEARS OF SERVICE



Youngstown

YOLOY STEEL PIPE

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

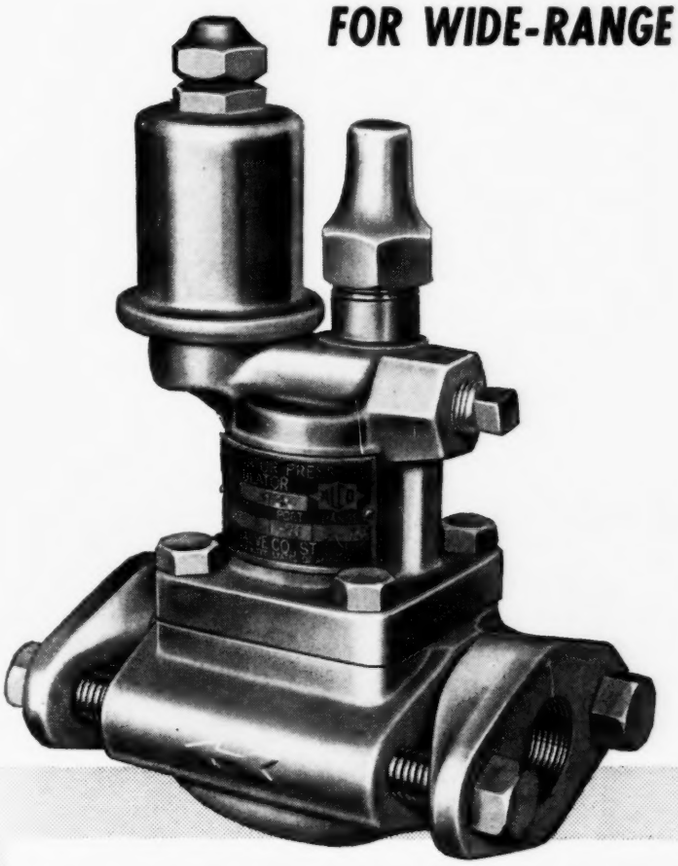
General Offices — Youngstown 1, Ohio

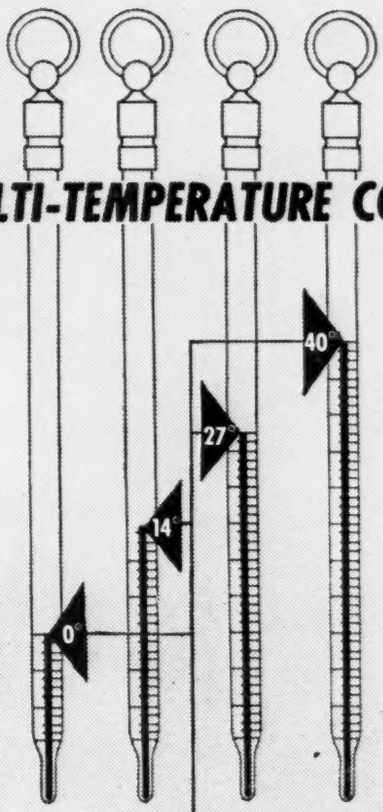
Export Office - 500 Fifth Avenue, New York

PIPE AND TUBULAR PRODUCTS - CONDUIT - BARS - RODS - COLD FINISHED CARBON AND ALLOY BARS - SHEETS - PLATES - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - RAILROAD TRACK SPIKES.

ALCO EVAPORATOR PRESSURE REGULATOR VALVES

FOR WIDE-RANGE MULTI-TEMPERATURE CONTROL





FOUR REASONS WHY YOU'LL GET *BETTER RESULTS* WITH ALCO EPR VALVES:

- Rugged, corrosion-resistant, simple come-apart construction for longer life and easier servicing.
- Precision-balanced to operate on minimum pressure differential.
- Pilot-operated for greater sensitivity. Available with either pressure or temperature pilots, remote or integral.
- They accurately maintain evaporator pressure and temperature regardless of sudden changes in load.

You can rely *completely* on ALCO EPR Valves to maintain a minimum evaporator pressure in cold storage rooms where pressure must be accurately controlled—or to prevent freeze-up damage to shell and tube coolers.

When you specify ALCO, all the 25 years' experience of the industry's leading control manufacturer is built into each Alco Valve.

SEE YOUR ALCO WHOLESALER

A QUARTER-CENTURY OF PIONEERING AND PROGRESS

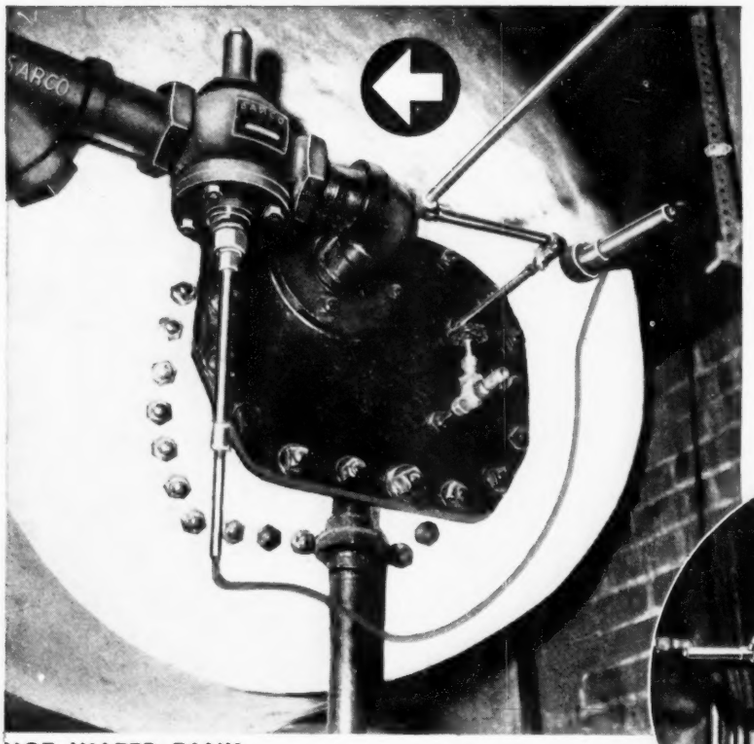
Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

ALCO HAS REFRIGERATION UNDER CONTROL

ALCO VALVE CO.

859 KINGSLAND AVE. • ST. LOUIS 5, MO.

4353



HOT WATER TANK

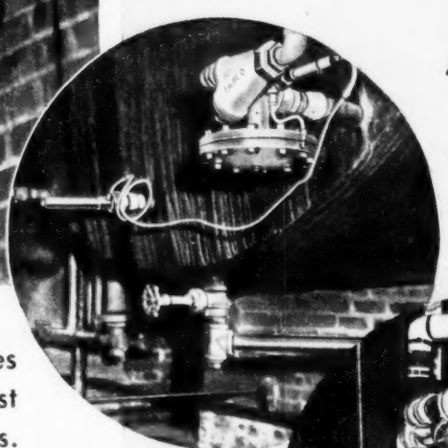
Why the Best HOT WATER SERVICE *Costs Less!*

It's not a luxury to have all hot water services Sarco Temperature Controlled. In fact, on most jobs, the controls pay for themselves in four ways.

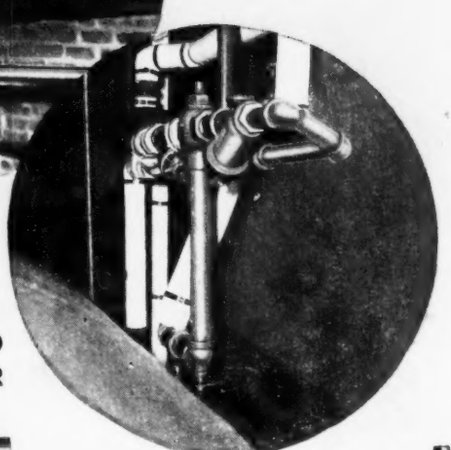
1. Automatic control prevents overheating — fuel is saved
2. "Never too hot, never too cold," increases quality and quantity of output in heat processing
3. Blending of water for showers and wash basins increases hot water storage capacity
4. Everything works, 24 hours a day, without shut-downs or complaints.

In a factory, a service tank was controlled for twenty-four years at a cent a day. A mine saved hundreds of dollars by installing Sarco Blenders for showers, and dish washing.

What would Sarco Temperature Controls save in your plant? Why not ask the Sarco Man near you?

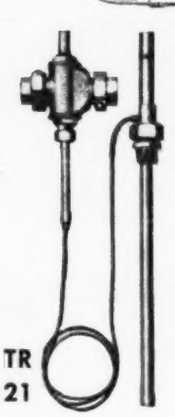


STORAGE TANK

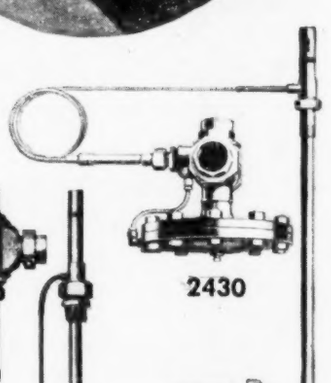


BLENDED WATER

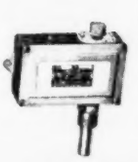
MB BLENDER



TR 21



2430



IMMERSION THERMOSTAT

241

SARCO

SAVES STEAM

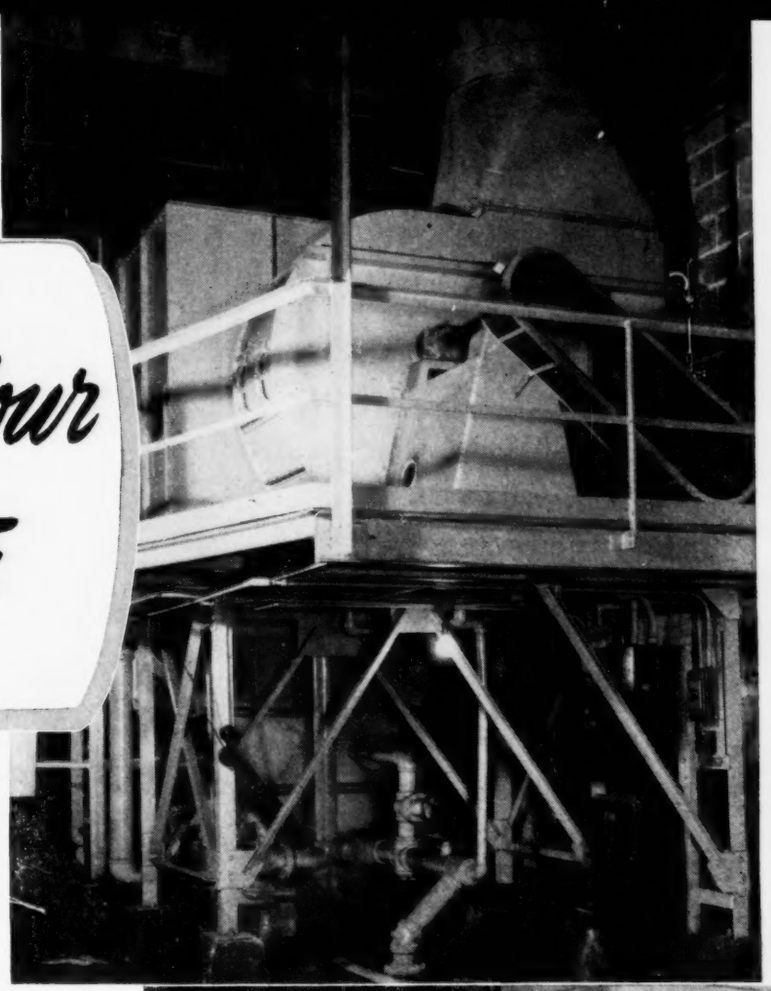
SARCO COMPANY, INC.

Represented in Principal Cities

Empire State Building, New York 1, N. Y.

SARCO CANADA, LTD., TORONTO 5, ONTARIO

"Buffalo" Limit-Load Fan and Air Washer cleaning foundry air.



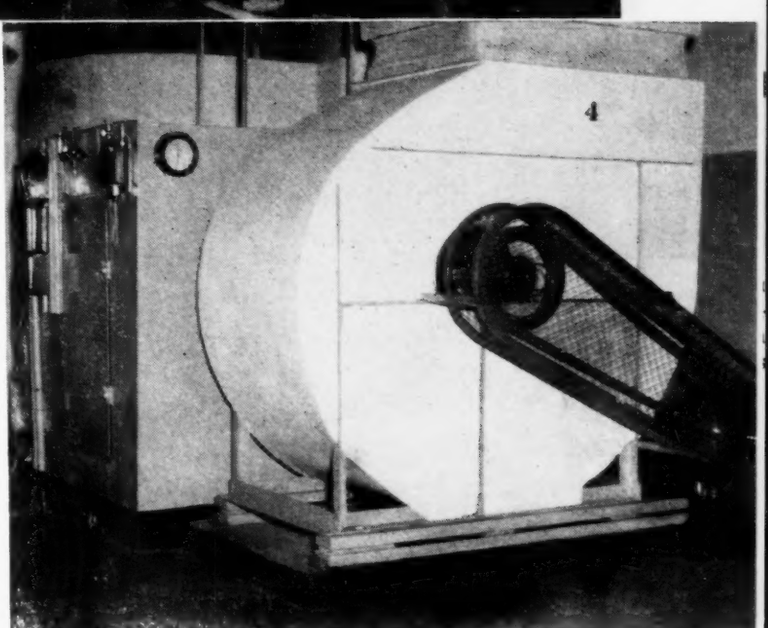
How You Can Put Your AIR TO BEST USE

"Buffalo" AIR CONDITIONING Can Do a Complete Processing Job

The industrial uses of air multiply daily! It's the recognized "comfort medium" that makes workers more efficient and productive. It's a "safety factor" which can minimize explosion dangers, fume poisoning and risk of "accident-prone" workers. *It can control your product quality, your turnout—and your profits —to a remarkable degree!* And present-day "Buffalo" Air Conditioning Units can create and maintain *any* air condition you require. You can wash your air, heat or cool it as desired, control the humidity exactly, collect dust by-products from your air—easily, continuously and economically—with "Buffalo" equipment.

"Buffalo" FANS Often The Only "AIR CONDITIONING" You Need

Modern, efficient fans perform many of the functions of air conditioning. A "Buffalo" Limit-Load Fan, for instance, can "cool by ventilation"—circulating air continuously throughout the plant and causing a cool, comfortable feeling. "Buffalo" Fans can remove harmful dust, fumes and excessive moisture from your plant air. In these and dozens of other ways, "Buffalo" Fans can put your air to profitable use.



"Buffalo" "LL" Fan and Comfort Conditioning Cabinet supplying conditioned air in a large office building.

IT COSTS YOU LESS THAN YOU'D THINK

"Buffalo" equipment is permanent equipment. Flimsy, light-weight "package" units are not part of our line. The results? Many "Buffalo" air washers are still giving efficient daily service over FORTY YEARS AFTER INSTALLATION. Many "Buffalo" Fans are OVER FIFTY YEARS OLD. Here, certainly, is long-run economy! Why not talk over YOUR air and its profit possibilities with a trained "Buffalo" engineer? Write us—we'll have him call on you AT NO OBLIGATION!

BUFFALO FORGE COMPANY

480 BROADWAY BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Branch Offices in All Principal Cities

TRANE

New Series 50 Evaporative Condenser cuts water consumption to a trickle. For loads 10-100 tons.

ANNOUNCING A NEW WATER SAVER

Here's a fluid answer to solid regulations restricting the use of water for air conditioning. Sleek, new Trane Evaporative Condensers SAVE WATER and use it over and over again.

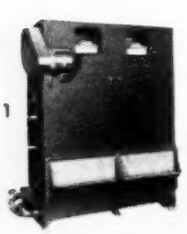
New Series 50 units—rated according to ASRE standards. Quality features include condenser coils made of everlasting copper tubing. Non-ferrous spray trees. Non-clogging nozzles. Hot-dip galvanized fan wheels and scrolls. Extra heavy shafts permit two-bearing, self-aligning assembly. Sturdily constructed for either indoor or outdoor installation.

See data Bulletin DS-350 for details on the complete line of Trane Evaporative Condensers.

THE TRANE COMPANY...LA CROSSE, WIS.

EASTERN MANUFACTURING DIVISION, SCRANTON, PA.

Manufacturing Engineers of Heating, Ventilating and Air Conditioning Equipment—Unit Heaters, Convector-radiators, Heating and Cooling Coils, Fans, Compressors, Air Conditioners, Unit Ventilators, Special Heat Exchange Equipment, Steam and Hot Water Heating Specialties ... IN CANADA, TRANE COMPANY OF CANADA, LTD., TORONTO.

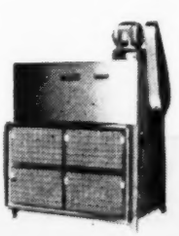


1

2

Versatile design of Series 50 (1) permits either left or right-hand drive. JN Series (2) for loads 3-10 tons. For complete air conditioning system specify Trane Compressors (3) and Climate Changers (4).

3



4

Tri-Flex
Aerovane
in 100 Park Avenue
. . . one of New York City's newest and most impressive skyscrapers, an outstanding example of modern trends in structural design, efficiency, comfort. Completely air conditioned, the 36-story tower is equipped throughout with T&B Standards . . . Tri-Flex and Aerovane Grilles and Registers . . . specified by men who know the important relation between the satisfactory performance of an air conditioning system and the distribution equipment they select. With T&B Standards installed, they can be sure of maximum, flexible control of air delivery to meet every requirement . . . another trouble-free job!
Tri-Flex FOR SUPPLY
Aerovane FOR RETURN
KAHN & JACOBS
Architects
GEORGE A. FULLER COMPANY
General Contractor
JAROS, BAUM & BOLLES
Engineers
KERBY SAUNDERS, INC.
Mechanical Contractor
For quick selection . . . economy . . . prompt delivery . . . specify and install Tri-Flex and Aerovane Grilles and Registers. For complete details and engineering data, write for Catalog 48S.
TUTTLE & BAILEY INC
NEW BRITAIN, CONNECTICUT

look-no hands!

this is your heating superintendent when you heat with Dravo Heaters

It's an *automatic* fireman who goes on the job at the flip of a switch for the Sanatex Company of Chicago. It cuts operational and maintenance expense to the bone and solves what had appeared to be an expensive heating problem for this processor of wiping cloths.

Not only is an attendant unnecessary—boiler-room and ductwork expense was eliminated, too, by installation of a Dravo *Counterflo* Heater. Centered along the east wall, the Dravo *Counterflo* Heater is entirely self-contained —requiring only power and fuel lines and a small vent stack. Its 1,000,000 BTU output is directed slightly over the heads of the workers to blanket 10,000 square feet of unbroken plant area with draft-free warm air. Cold corners and excessive roof heat loss are eliminated. During summer months, a touch of the selector switch converts the Dravo *Counterflo* Heater immediately into a powerful air-circulating unit.

Dravo *Counterflo* Heaters are available in sizes ranging from 400,000 to 2,000,000 BTU output. Equally efficient with oil or gas and with or without ductwork, they can be floor-installed, wall-hung or roof-hung. Write for Bulletin GC-516. Heating Section, Dravo Corporation, Dravo Building, Pittsburgh 22, Pennsylvania.

According to Mr. Schulman, President of Sanatex Company, the Dravo *Counterflo* Heater "is the best equipment we ever had. Delivery of heat is virtually instantaneous when the unit goes into action—an important fuel-saving feature which eliminates the need for anticipating cold spells or keeping the heater in operation when the plant is closed."

PITTSBURGH · CLEVELAND
PHILADELPHIA · DETROIT
NEW YORK · CHICAGO
ATLANTA · BOSTON

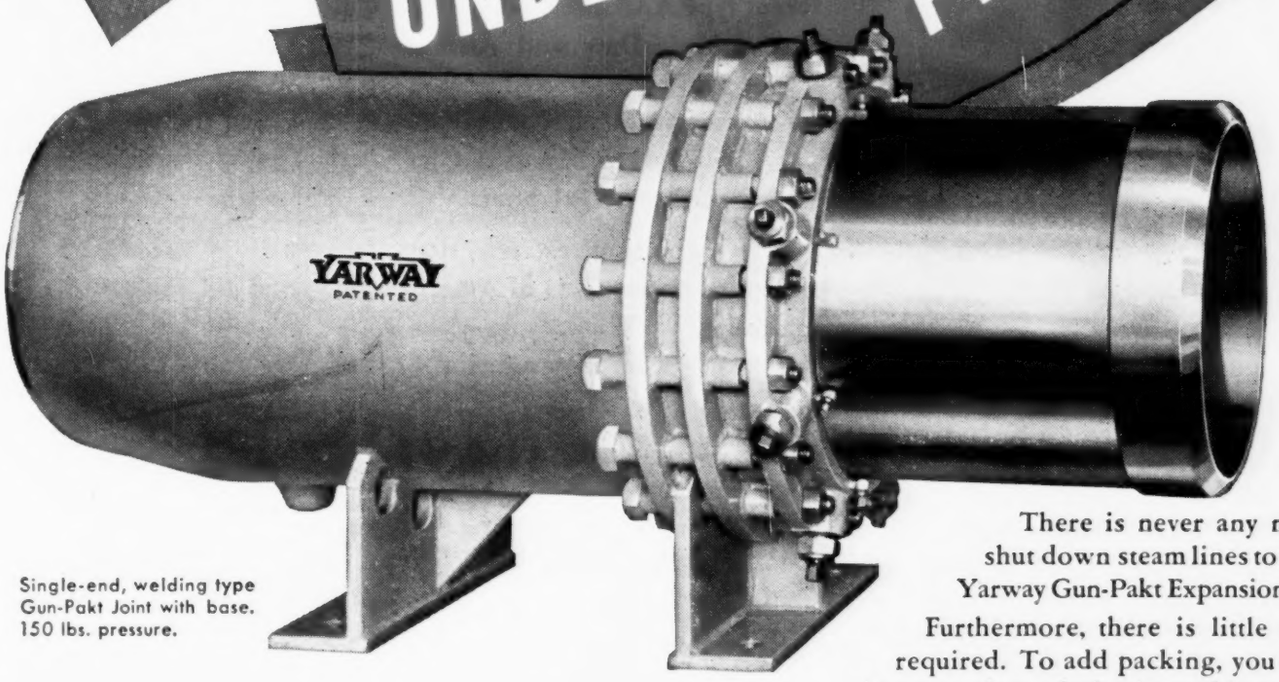
DRAVO

Dravo also manufactures the DRAVO CRANE CAB COOLER for air conditioning hot-metal crane cabs.

DRAVO CORPORATION

Sales Representatives in Principal Cities

THIS EXPANSION JOINT IS SERVICED UNDER FULL STEAM PRESSURE



Single-end, welding type Gun-Pakt Joint with base. 150 lbs. pressure.

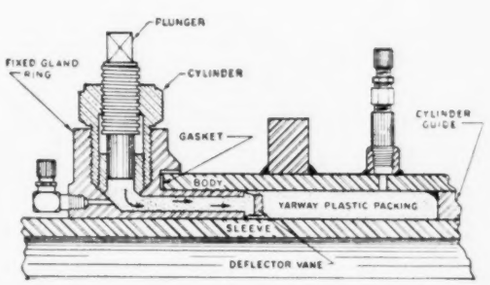
There is never any need to shut down steam lines to service Yarway Gun-Pakt Expansion Joints.

Furthermore, there is little service required. To add packing, you simply insert a plug of plastic packing, turn a wrench, and the job's done! Special Alemite fittings provide for proper lubrication.

Maintenance costs are trifling. One large user reports 65 cents per year per joint. Others claim less than that.

Gun-Pakt Joints are available with single or double-ends, welding or flanged types, in sizes from 2″ to 30″, with traverses from 4″ to 24″, and for pressures to 400 psi.

For the full Gun-Pakt story, write for Yarway Bulletin EJ-1912.



Close-up of cross-section showing detail of Gun-Pakt feature.

YARNALL-WARING COMPANY
104 Mermaid Avenue, Philadelphia 18, Pa.
Branch Offices in Principal Cities

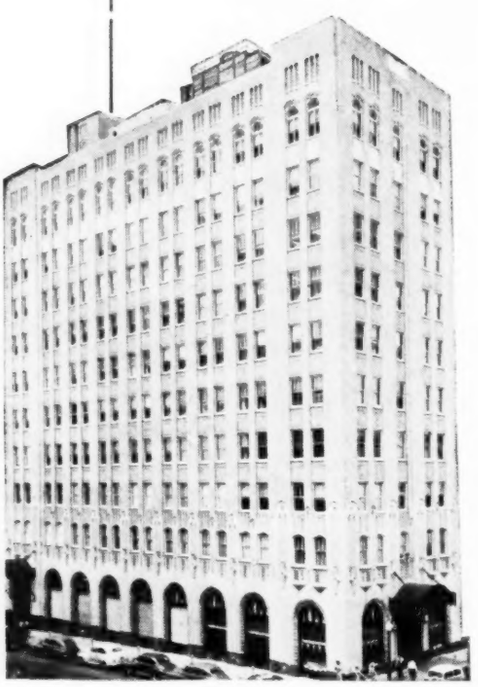
YARWAY

GUN-PAKT EXPANSION JOINT

For more information on products advertised, use Inquiry Card, page 97

Clean air tailored to building needs

3 types of AAF filters serve Oklahoma Natural Gas Building



Coston & Frankfurt,
ARCHITECTS & ENGINEERS
Watt Plumbing & Air Conditioning Co.
AIR CONDITIONING CONTRACTOR

THERE is no one stock solution for every air filtering problem. That's why three different type AAF filters—Electro-Matic, Multi-Duty and Airmat PL-24 are incorporated in the air conditioning system of the new Oklahoma Natural Gas Building, Tulsa, Oklahoma.

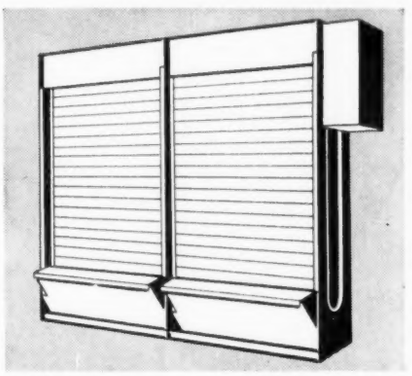
It is significant, though, that all units are products of American Air Filter. The reason—AAF is the only company offering a complete line of filters. That means both unbiased recommendations and a single responsible source for the overall air cleaning job.

Filtered air is a sound investment for every business. And it's a better investment when you can recommend to your customers the right filter for every job. And with it goes the assurance that, regardless of choice, the units selected are of proved design and performance. For information on this complete filter line call your local AAF representative or write—

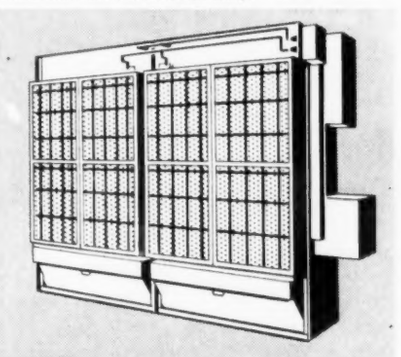
AMERICAN AIR FILTER COMPANY, INC.
294 Central Avenue, Louisville 8, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

AAF
AIR FILTERS
AND ELECTRONIC PRECIPITATORS

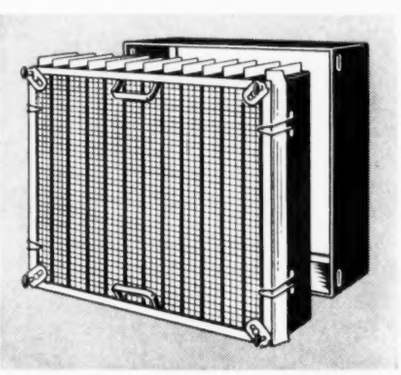
AAF offers the only complete line of AIR FILTERS and ELECTRONIC PRECIPITATORS



MULTI-DUTY automatic viscous filters provide a constant, unvarying supply of air at a uniform resistance and with minimum maintenance for the Oklahoma Natural Gas Building.



ELECTRO-MATIC, the only automatic electronic precipitator in which the self-cleaning feature simplifies maintenance and minimizes the human element as a factor of satisfactory performance.



AIRMAT Type PL-24, the most widely used dry type air filter for air conditioning and industrial ventilation. The inexpensive, disposable Airmat paper assures simple and convenient maintenance.

Remember—
Only AAF offers "SELECTIVE AIR FILTRATION" ...the right filter for every job

The NEW HONEYWELL AUTOMATIC-RESET PNEUMATIC RELAY

Maintains Exact Temperatures . . . Under Any and All Load or Lag Conditions

AUTOMATIC-RESET PNEUMATIC RELAY, NO. RO900A.

INTERESTED in the *best* pneumatic control performance available?

Here it is! Honeywell's new Automatic-Reset Pneumatic Relay. It maintains exact temperatures under any conditions by using the new principle of *reset action.* Reset action, when added to a proportional-acting pneumatic control system, causes the valve (or motor) to move farther in response to a given load change than with proportional control alone—just enough farther to restore the temperature approximately to the set point. Thus most of the offset characteristic of proportional control is eliminated.

WITH *RESET ACTION* YOU BENEFIT FOUR WAYS

BETTER CONTROL—You're assured of a system that maintains the temperature set on the controller.

GREATER STABILITY—Because *reset action* reduces offset by 90% and allows wider throttling range settings, the system will have greater stability with no hunting or cycling.

MORE COMFORT—No matter how severe or mild the heating requirements become, *reset action* holds the temperature just as it is wanted for comfort. There's no need to worry about changing conditions causing the temperature to drift away from the thermostat setting.

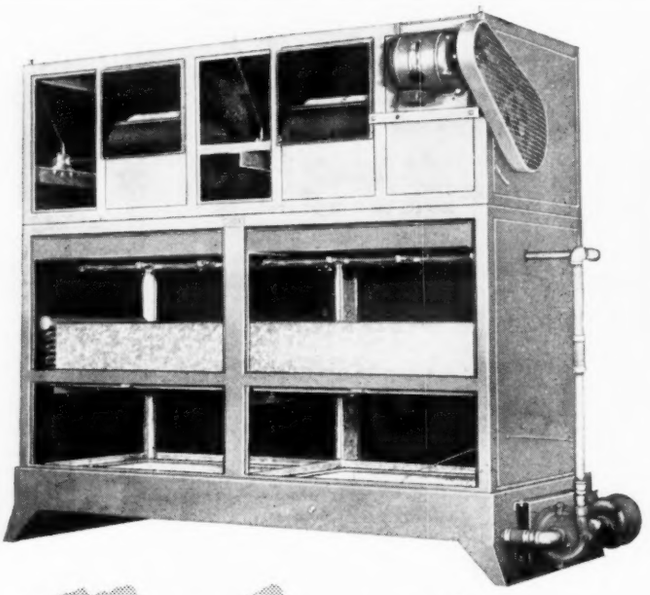
SIMPLE INSTALLATION—The Automatic-Reset Relay can be inserted in a new pneumatic control system at any point in the branch line where it is convenient to do so. It may also be added to existing control systems merely by cutting it into the controller branch line and supplying it with main air pressure. This single, inexpensive unit can be used with any standard pneumatic controller and can be applied to most existing systems without replacing the primary controller.

The Honeywell Automatic-Reset Relay is today's outstanding news in pneumatic control. You'll want to be fully informed. Call the Honeywell office in your city, or address a card to Minneapolis-Honeywell, Minneapolis 8, Minnesota. In Canada: Toronto 12, Ontario.

MINNEAPOLIS **Honeywell**

FIRST IN CONTROLS

77 BRANCHES FROM COAST TO COAST WITH SUBSIDIARY COMPANIES IN: TORONTO • LONDON • STOCKHOLM • AMSTERDAM • BRUSSELS • ZURICH • MEXICO CITY

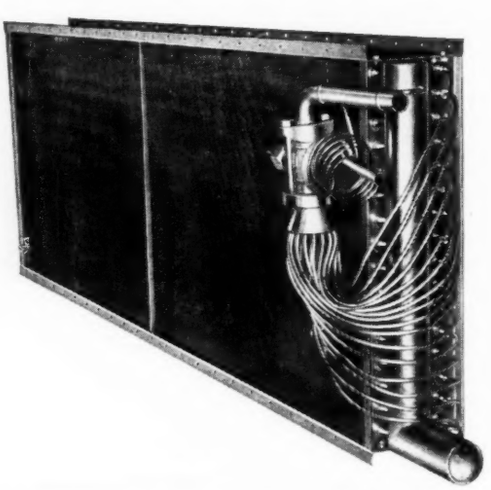


NUTS!

and good Bolts too!

KENNARD *Engineered*

EVAPORATIVE CONDENSERS
AIR CONDITIONING UNITS
COOLING TOWERS
BLAST COOLING, HEATING, AND REFRIGERATION COILS



"Refinement of Detail Marks the Difference Between Ordinary and Excellent."

NUTS, for instance—as well as all washers, bolts and metal screws are ***always*** **of non-corrosive** Stainless Steel or Silicon Bronze or Brass in all E C and C T Units. Even the coil frames have Silicon Bronze fasteners to bolt up the non-corrosive frame sections and tube sheets. Such "refinement of detail" insures that whenever you may need to take the unit apart—it can be done quickly, easily and without fighting and replacing corroded-together fasteners.

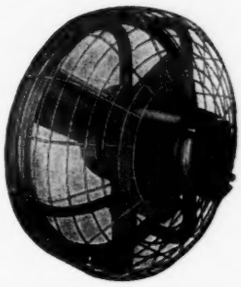
Yes, we DO go to extremes to make Kennard products as good as can be made to deliver *plus value* in low-cost and long-lived performance.

Other Kennard quality features you will like are non-corrosive coil frames, scale-free coils, sectional galvanized unit frames, Penta-Post construction, multiple access panels, solid bronze latches, etc. . . . an ensemble of quality construction that makes "KENNARD ENGINEERED" signify *the best!*

Write for Bulletins...
No. 47A — FINNED COILS
No. 486 — AIR CONDITIONING BLOWER UNITS
No. 491 — EVAPORATIVE CONDENSERS
No. 494 — COOLING TOWERS

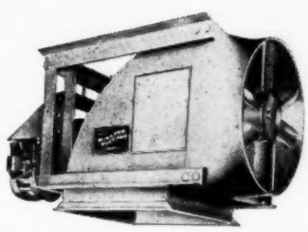
KENNARD CORPORATION • 1823 S. HANLEY ROAD ST. LOUIS 17, MISSOURI

WING VENTILATING EQUIPMENT



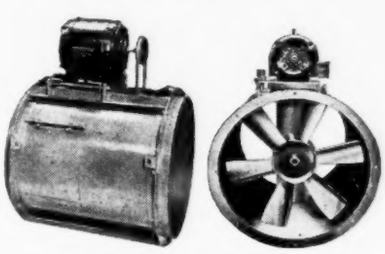
WINGFOIL SAFETY VENTILATING FAN

Distinguished for efficiency and rugged construction. The new Wingfoil fan wheel moves maximum volumes of air with minimum horsepower, due largely to its non-overloading feature. Sizes from 10" to 60" dia., with free air capacities from 825 to 59,000 CFM. Larger sizes on special order. Either direct or belt drive. Heavy steel guards provide safety.



WINGFOIL DUCT FAN
(Elbow Type)

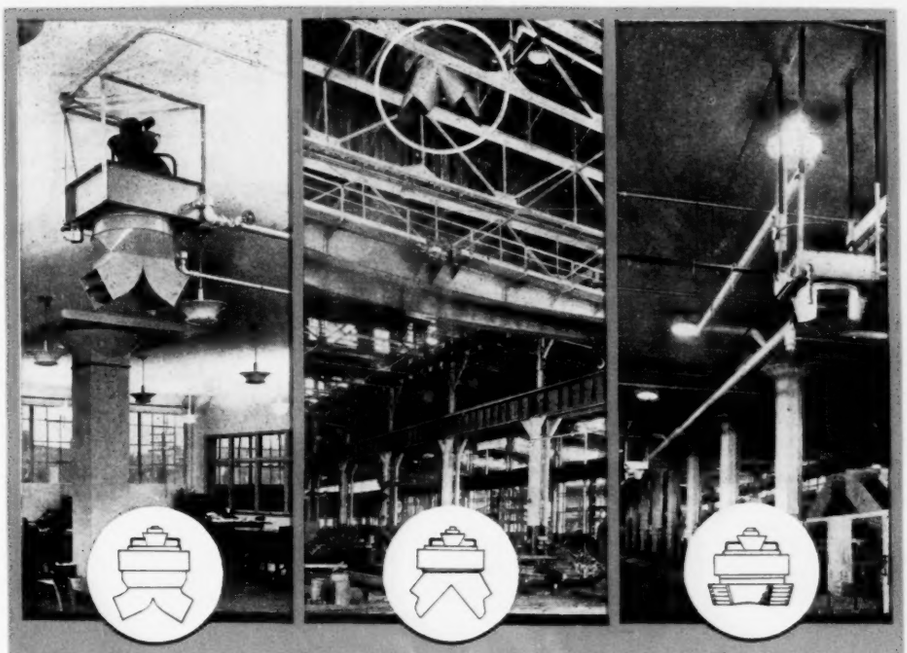
Designed to form an elbow in the duct system, the elbow-shaped housing in a strong rectangular frame permits installation with the inlet in any desired position. Motor and drive are outside the air stream, therefore remain cool, clean, and easily accessible. The new Wingfoil Fan has a remarkable "non-overloading" characteristic. Sizes 10" to 60"; capacities up to 85,000 CFM.

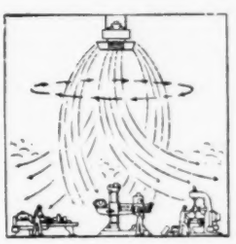


WINGFOIL DUCT FAN
(Straight Line Type)

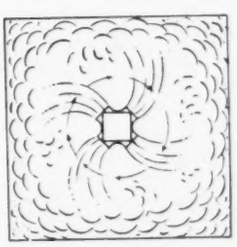
Designed to form a part of any straight run of duct. The motor is mounted on an adjustable base outside of the housing. V-belt drive is through an air tube carried across the housing and supporting fan shaft and bearings. Fan wheel is the new non-overloading Wingfoil Fan. Bearings are grease-sealed, requiring minimum of attention.

WRITE FOR BULLETINS





SIDE VIEW—Showing moving streams of heated air sweeping slowly around complete circle.



TOP VIEW—Showing coverage.

The distinguishing feature of the WING Revolving Unit Heater, which makes its performance so outstandingly superior to other heaters is the Revolving Discharge Outlet. These outlets, moving slowly through a complete circle, flood the entire heating area with a blanket of fresh, live, warm air. The gentle air motion caused by the constantly changing directions of the heated air from the revolving outlets creates a refreshing, stimulating atmosphere beneficial to employee morale and productivity. Hot blasts and chilly areas are eliminated. Get complete information by writing today for Bulletin HR-5.

L. J. Wing Mfg. Co.

Executive Offices and Factory: 158 Vreeland Mills Road, LINDEN, N. J.
Canadian Factory: Montreal.

Manufacturing Licensee for Wing Unit Heaters in Western Europe— ETABLISSEMENTS WANSON — 9, rue Mogador, Paris 9e, France Nouveau Boulevard de la Woluwe, Haren-Nord, Brussels, Belgium

Wing

Revolving UNIT HEATERS

They're NEW!
They're YOURS
for the asking!

Steam Turbine Drive
2CCC—220 Tons
2DDD—300 Tons
2EEE—350 Tons
2FFF—450 Tons
2GGG—600 Tons
Allow 3 Feet for Removal of Eliminators from Intercooler (Compressor End of System)
Allow 12 Feet at One End of Shells for Tube Cleaning
Scale ¼ Inch
York

Templates for York Turbo Systems!

Motor Drive - Steam Turbine Drive

Slash hours of tedious drafting from your next turbo system job. Specify "York". . . and use York's new templates in both $\frac{1}{8}$" and $\frac{1}{4}$" scale for York's line of Turbo Systems ranging from 220 ton to 1500 ton capacity.

Another example of "York's business is improving your business!"

Act Today

Supplies of these new templates are limited. To assure getting yours without delay, better get in touch with your York District Office now. And remember, your York-trained representative is an able, fully qualified engineer. His technical experience can save you valuable time in detail work. York Corporation, York, Pa.

"See Your Architect, Engineer, Contractor, First"

York believes in channeling contract work through you, and York gives you unequaled support in providing the very finest central station systems possible:

- **a complete line of equipment**
- **competitive prices**
- **accurate, dependable product ratings**
- **technical assistance based on "case histories"**
- **cooperation with architects, engineers, and contractors**
- **practical help from York-trained engineers**
- **a national organization**
- **continuous product research and development**
- **certified maintenance**

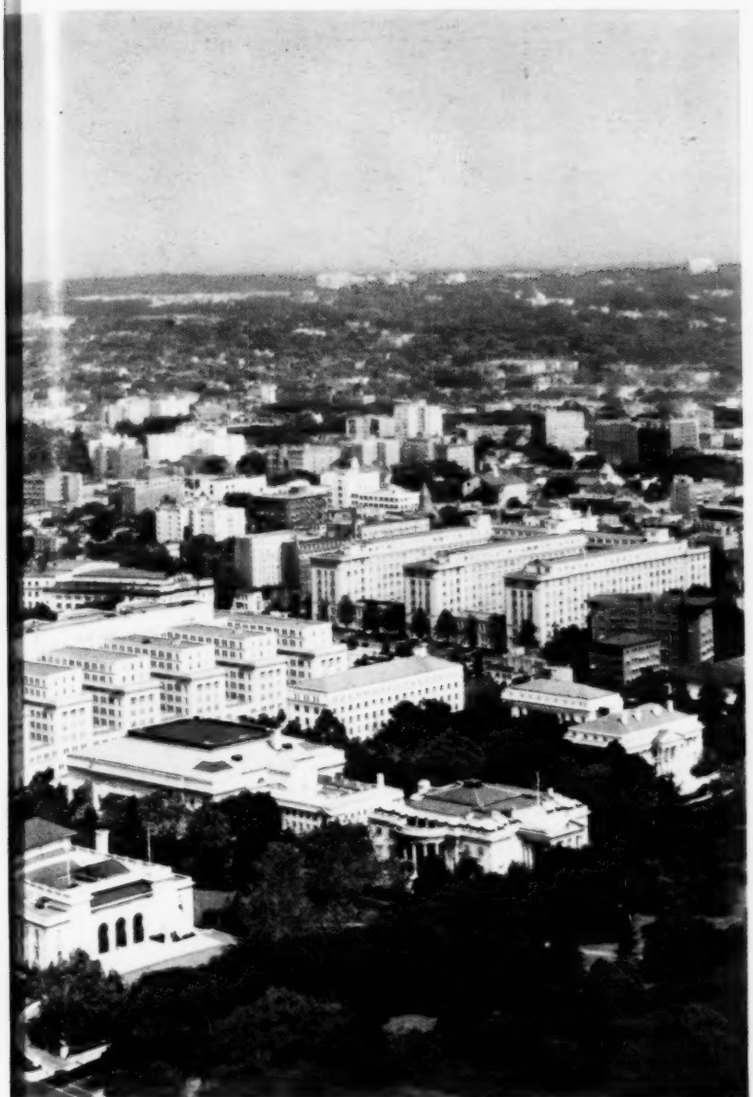
York's complete line of refrigeration and air conditioning products are the result of 65 years of know-how and research. Your clients have faith in the name.

York refrigeration air conditioning

The big advances come from YORK

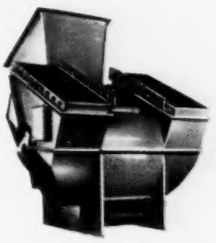
Headquarters for— **Refrigeration and Air Conditioning**

American Blower—a time-honored name in air handling



In Washington, as in other cities, American Blower Air Handling Products serve commerce, industry and public utilities. For air handling data in the Washington area, call American Blower—National 8120. Elsewhere, consult your phone book.

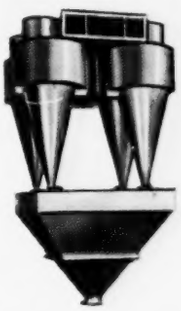
Venturafin Unit Heaters



Mechanical Draft Fans

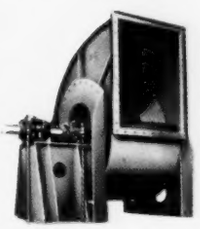
Utility Sets

Ventura Ventilating Fans

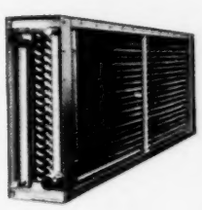


Dust Collectors

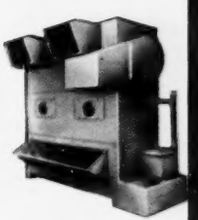
Air Washers



Industrial Fans



Heating and Cooling Coils



Air Conditioning Equipment

All air handling equipment is not alike. There's a vast difference in quality, design, quietness, operating costs and efficiency. Look before you buy and you'll buy American Blower products—the accepted quality standard—proved in test after test by buyers.

Air is free . . . use it profitably!

The buyer of an American Blower Kitchen Fan . . .

The public utility which orders American Blower Forced and Induced Draft Fans and Fluid Drives . . .

The cement plant which installs American Blower Air Handling Equipment and Dust Collector . . .

All these buyers get one thing in common.

They get equipment which is built by a manufacturer with a background of 69 years' experience—equipment which is tested in accordance with the Standard Test Code and carries Certified Ratings. In addition, they know that, whether the product costs $43.75 (price of an Aeropel) or runs into thousands (power plant equipment), they get the benefits of American Blower's research and high quality.

To buyers of air handling equipment, these plus values insure lower operating costs and long, dependable service.

To contractors with an eye to the future, these same factors insure satisfied customers and fair profits.

Our nearest branch office will give you full data.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary corporation

YOUR BEST BUY

AMERICAN BLOWER

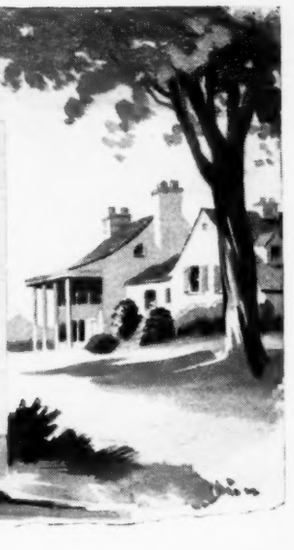
AIR HANDLING EQUIPMENT

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

THERE'S KEWANEE DEPENDABLE HEAT...

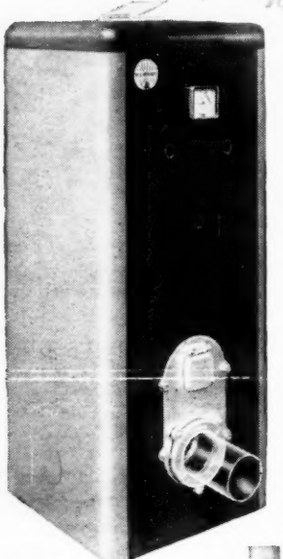
for every size home-
for every price home



KEWANEE

STEEL BOILERS

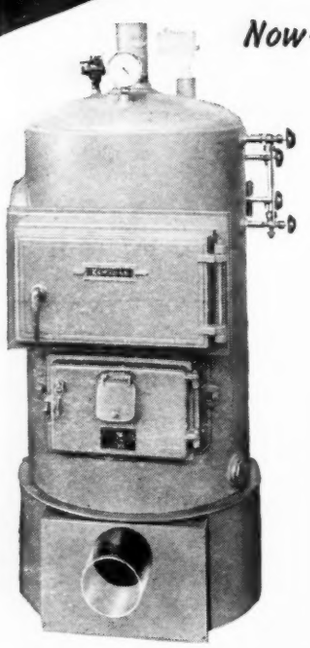
Whether heated with conventional radiators, wall, floor or ceiling panels, or radiant baseboard . . . with oil, gas or coal (hand or stoker fired) . . . there is a Kewanee Steel Boiler just right for the purpose. And each size and type provides that extra dependability with economy of fuel which has made Kewanee Boilers famous for more than 80 years.



KEWANEE
Cottage Boiler
Vertical Tubestyle for hot water heat in small homes.

Now—for the budget home there is the new Kewanee Cottage Boiler; a sturdy steel vertical tube unit in a smart two-tone green, insulated jacket. Rated to produce 77,000 Btu, this Kewanee is capable of producing enough extra heat to take care of overloads of 50% and more.

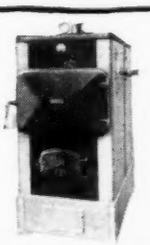
As an additional feature, a built-in copper coil water heater provides an abundance of hot water for kitchen, bath and laundry. Yet, with all of these "big boiler" characteristics, the Cottage Boiler is so priced that it comes well within the limits of the modest budget.



KEWANEE
Round Type "R"
330 to 900-sq. ft. steam radiation. Jacketed or unjacketed.

For Large Homes and Medium Size Buildings

Type "R" Square Heat fills a long felt need. It is built in 8 sizes to heat 740 to 3000-sq. ft. steam radiation; or 1180 to 4800-sq. ft. water radiation; and capable of operating at full efficiency whether the boiler is just "loafing along" in mild weather or being pushed far beyond its rated capacity when temperatures tumble below zero.



KEWANEE BOILER CORPORATION

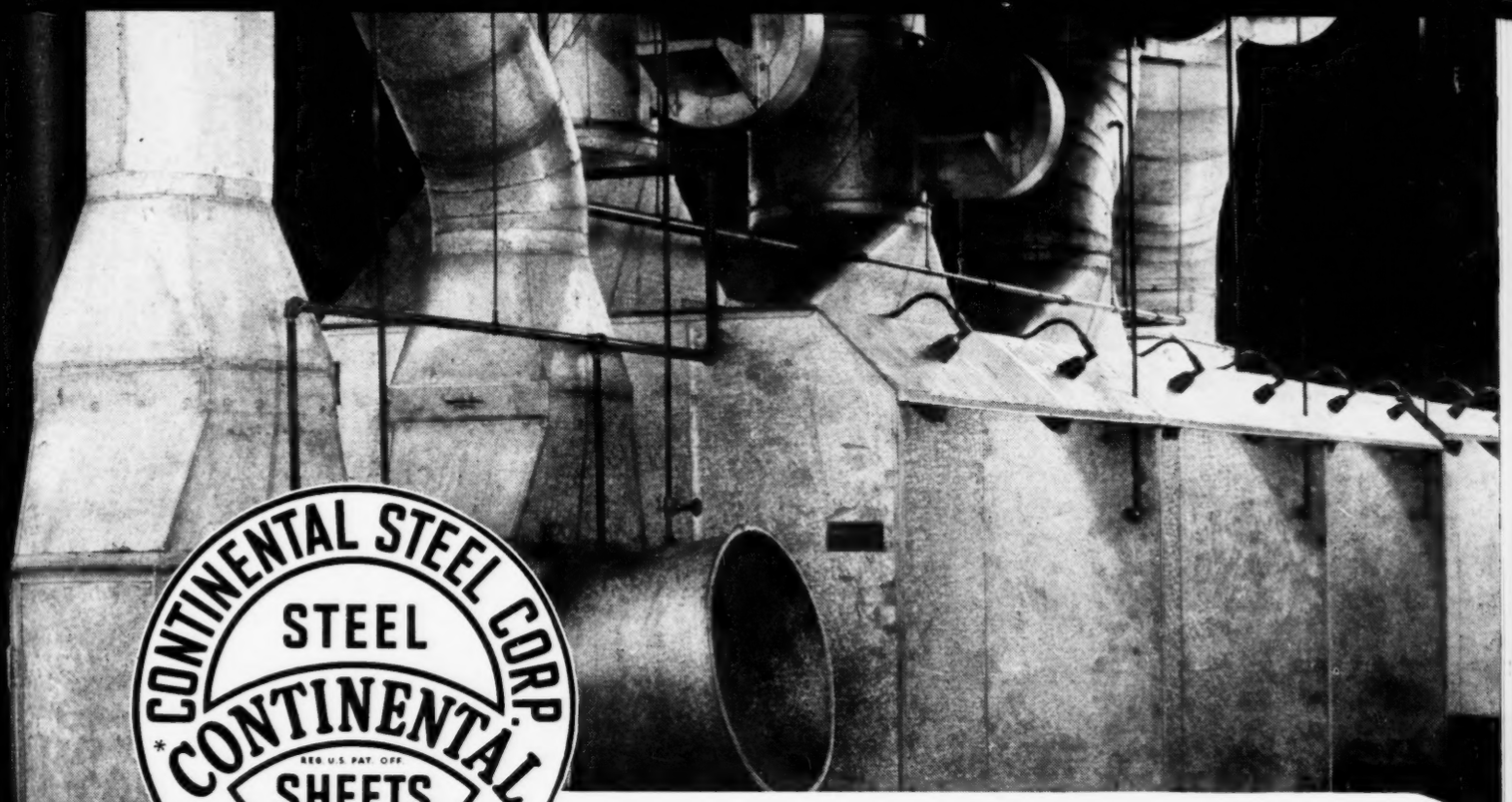
BOILERMAKERS 80 YEARS KEWANEE, ILLINOIS

Branches in 60 Cities—Eastern District Office: 40 West 40th Street, New York City 18

Division of AMERICAN RADIATOR & STANDARD SANITARY CORPORATION

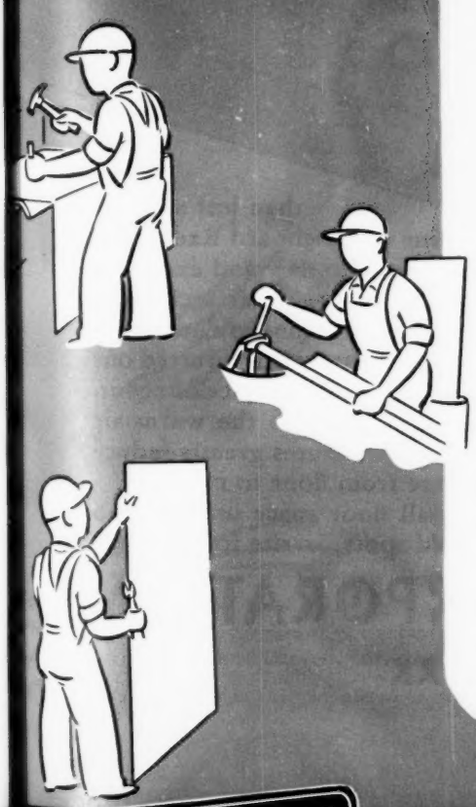
Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON



CONTINENTAL STEEL CORP. * STEEL CONTINENTAL SHEETS REG. U.S. PAT. OFF. KOKOMO, IND.

For PRODUCTS WITH THE Toughest Specifications



If your product is made from commercial quality, galvanized steel sheets, the chances are that you are fairly well satisfied with the *base* metal you are now using. But how about the *zinc coating?* If it tends to peel or fracture under forming operations, you will be interested in getting the facts on Continental Commercial Galvanized Sheets. They are noted for their exceptional workability where abrupt formations occur in product fabrication. Ventilators and air-conditioning ducts, spray booths, poultry housing and feeding equipment, furnace pipes and casings are but a few examples of Continental Commercial Galvanized applications. Users of these sheets like their uniformity of temper, flatness and bright, clean appearance. If you are seeking new economies as well as superiority in final products, ask your jobber about Continental Galvanized Sheets or write to Continental at Kokomo, for steel sheet service information.

* Tr. Mks. Reg. U. S. Pat. Off.

CONTINENTAL STEEL CORPORATION

GENERAL OFFICES • KOKOMO, INDIANA

PRODUCERS OF *Steel Sheets*, including: Continental GALVANIZED, KONIK and COPPER-STEEL culvert sheets.

COPPER-STEEL Galvanized, KONIK steel sheets Galvanized, DULL COAT, Continental GALVANNEALED, ELECTRICAL, Hot Rolled Pickled.

ALSO, Manufacturer's Wire in many sizes shapes, tempers, and finishes, Continental Chain Link Fence, Nails, and other steel products

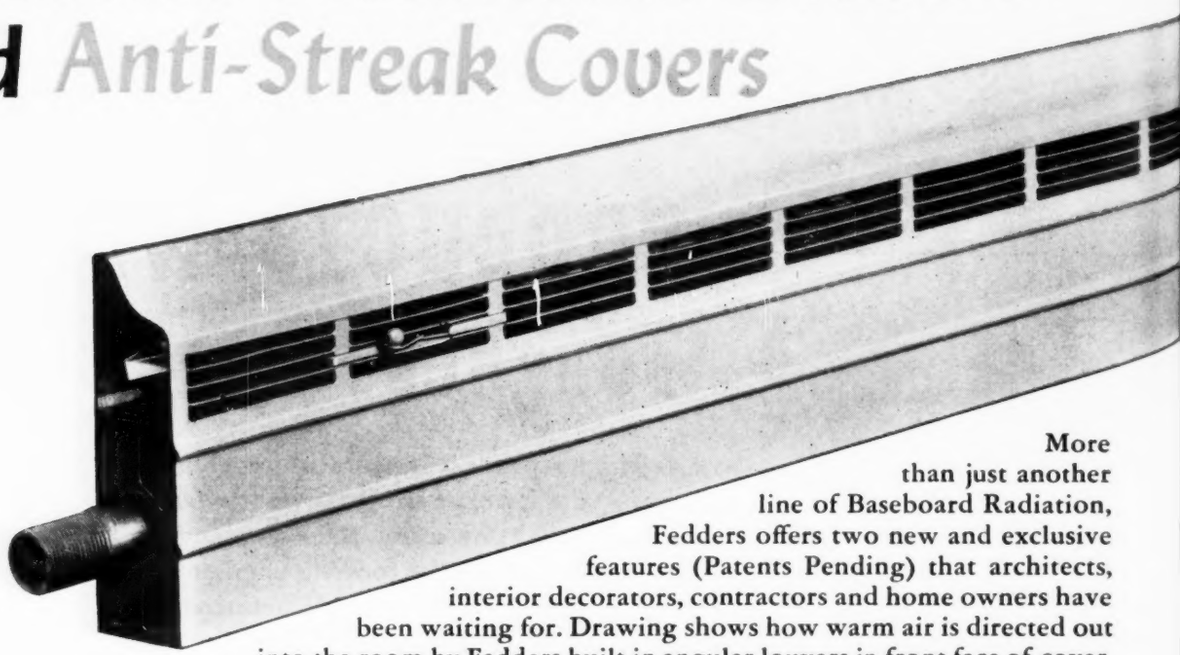
ANNOUNCING

NEW fedders

A GREAT NAME SINCE 1896

Baseboard Radiation

with Exclusive Directional Louvers and Anti-Streak Covers



More than just another line of Baseboard Radiation, Fedders offers two new and exclusive features (Patents Pending) that architects, interior decorators, contractors and home owners have been waiting for. Drawing shows how warm air is directed out into the room by Fedders built-in angular louvers in front face of cover. Also see how cool air flows down from the wall and is directed out into the warm air stream by means of specially designed curved top of cover. These features greatly reduce streaking of walls and contribute to uniformity of temperature from floor to ceiling.

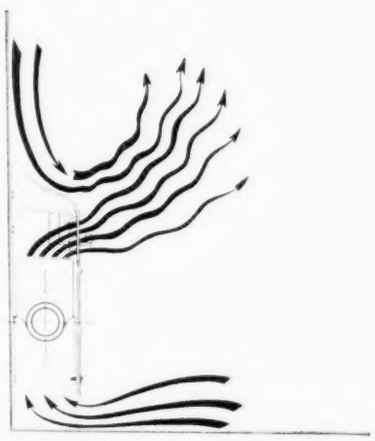
Designed for use with circulating hot water... makes all floor space usable... no interference with location of furniture... uniform heat, no cold spots... write for Bulletin.

FEDDERS-QUIGAN CORPORATION

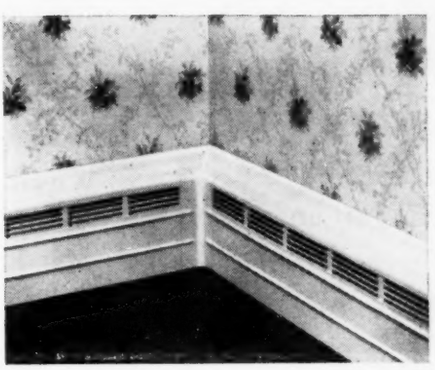
BUFFALO 7, NEW YORK

fedders

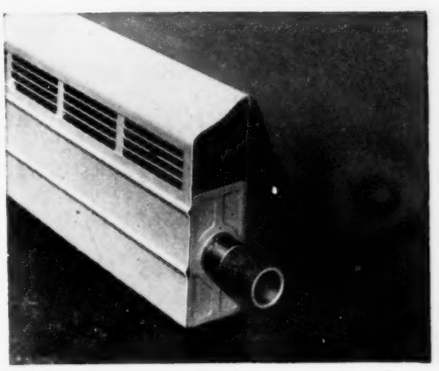
● Showing compact installation of Fedders Baseboard Radiation occupying little more space than ordinary wood baseboards.



Cross-section shows how air is directed out away from walls by means of exclusive directional louvers and curved, anti-streak covers.



Neat installation for inside and outside corners provided by Fedders overlapping corner pieces.



Showing position of Fedders high efficiency heating finned element within the cover.

Quigan

STRONGER FRAMES • REINFORCING RODS
MORE MEDIA • HOLDS MORE DIRT • EASIER TO CLEAN
HERRINGBONE-CRIMP MEDIA DESIGN • HANDLES 50% MORE AIR PER UNIT
You get measurably more for your money in FAR-AIR® Filters!

These and many more quality features make FAR-AIR Filters the choice of discriminating organizations. They are available in a wide range of types and sizes for dirt, lint, grease, entrained water, ink, paint and most other filtering applications. Sturdy construction and precision engineering gives them longer service life.

•

Every claim made for FAR-AIR Filters can be proved by you with a simple test. For complete information, write to Farr Company, 2615 Southwest Drive, Los Angeles, California.

Among the users of FAR-AIR Filters are:

Westinghouse Electric Corp.
General Electric Company
Standard Oil Co. of Indiana
R.C.A. Victor Division
A. B. Dick Company
U. S. Armed Forces

*Trade Mark Registered

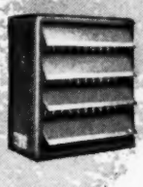
herringbone- FAR-AIR FILTERS "Better by Farr" *-corrugations*

FARR COMPANY *Manufacturing Engineers*

Los Angeles • Chicago • New York

Mf'd under license by Control Equipment Co., Ltd., Montreal, Canada.

Since 1889 **61 Years of Progress and Development**



nyb

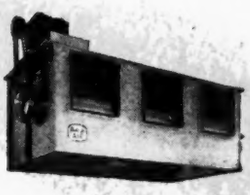
COMET EXHAUSTAIR

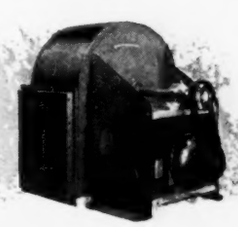
Propeller type ventilating fans deliver large volumes of air at low resistance and low current consumption. All wheels are machine balanced for smooth, vibrationless operation. They are laboratory tested, accurately rated and fully guaranteed in strict accordance with Standard Codes.

Made in two types and 7 basic sizes to cover a wide range of applications. Capacities from 400 CFM to 23,500 CFM.

Write for Bulletin 494

MEMBER NATIONAL ASSOCIATION OF FAN MANUFACTURERS AND INDUSTRIAL UNIT HEATER ASSOCIATION





nyb

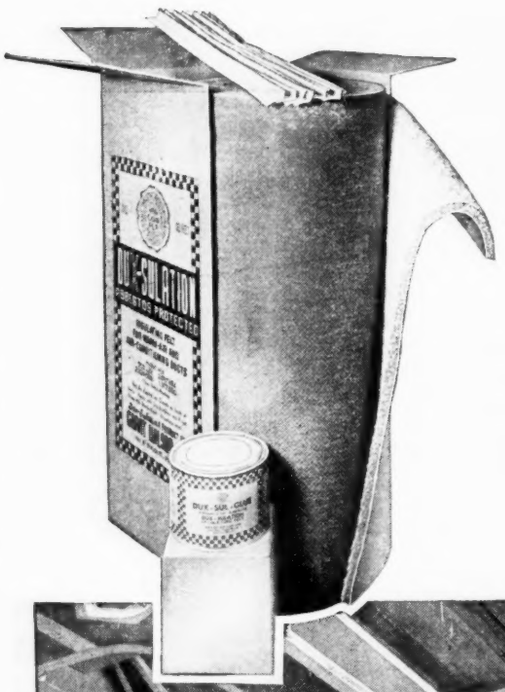
THE NEW YORK BLOWER COMPANY

GENERAL OFFICES • 32nd STREET & SHIELDS AVENUE • CHICAGO - 16

FACTORIES AT LAPORTE, INDIANA AND CHICAGO, ILLINOIS

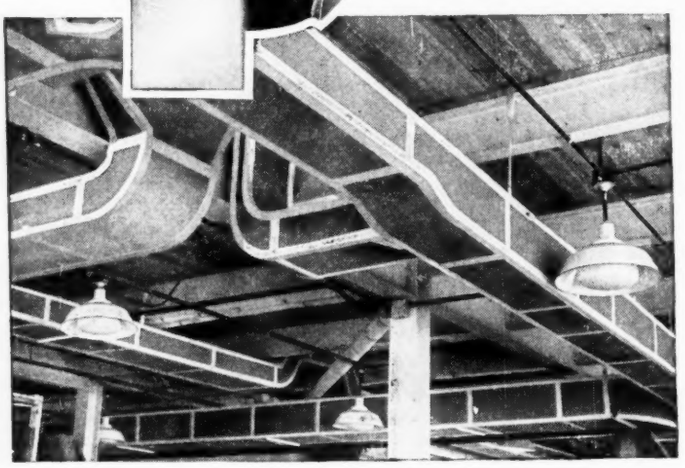
Good for CASTLES...

...and for COTTAGES, too



Grant Wilson DUX-SULATION (ASBESTOS-PROTECTED)

. . . keeps cool air cool or warm air warm between source and outlet — the "deluxe" specification that delivers MORE COMFORT as well as MORE ECONOMY!



Dux-Sulation guarantees less temperature loss between furnace and register or air conditioner and grille. It helps equalize long and short runs, eliminates those "hard-to-heat" (or to cool) areas, and hushes mechanical noises to a new standard of silence.

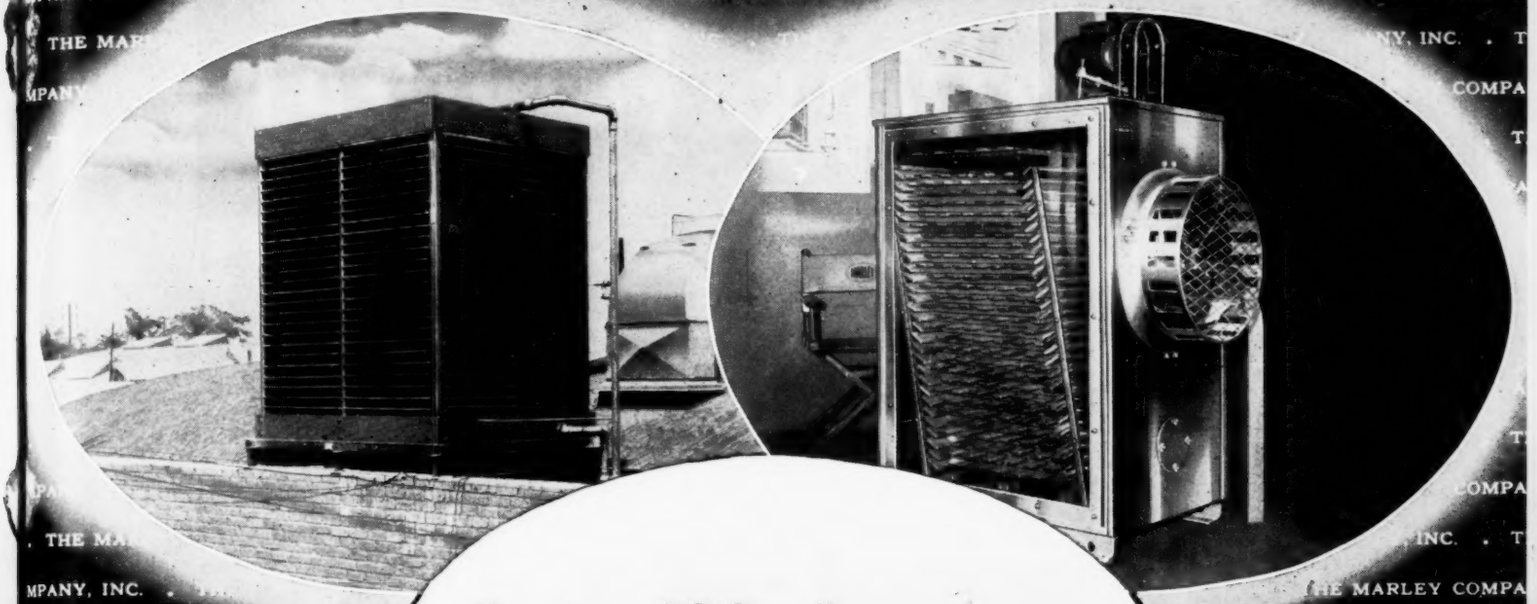
Whether for heating or cooling systems, Dux-Sulation is the "deluxe" specification that, at the same time, actually reduces operating costs – that pays for itself over and over in fuel or power savings. Equally practical for low cost housing projects, swank hotels or giant Industrials, Dux-Sulation makes ANY duct installation better! May we send you complete facts?

QUICK FACTS

Grant Wilson Asbestos-Protected Dux-Sulation is a Thermal Acoustical insulation engineered specifically for duct application. With a K factor of .27 BTU, its insulation efficiency exceeds 75%; sound absorption is approximately 61%. Rot-proof, mildew-proof and insect-proof, Dux-Sulation can be applied to either the inside or outside of round, rectangular or irregular ducts—won't chip, crack or buckle and is flexible for easy bending—½" or 1" thickness in 36" rolls about 33 feet in length. Special tape and glue (included) make installation quick and simple. Write Grant Wilson, Inc., 141 West Jackson Boulevard, Chicago 4, Illinois.

SEND FOR THIS FREE SAMPLE
(Kit 5V)

Grant Wilson inc.
ASBESTOS and INSULATING MATERIALS



Series 100 - Aquatower

"A One-Two Punch.."

...to solve any 3 to 50 ton water cooling problem

NO WATER cooling problem in the 3 to 50 ton range is too tough for this proven "Marley team." Either the mechanical-draft Aquatower or the natural-draft Series 100 will meet your specifications . . . no matter whether your problem is low first cost, low operating cost, unusual performance requirements or pumping problems. Nor is location a problem, as one of these two units can be placed anywhere . . . roof, basement, attic, outdoors, elevated grillage, or even suspended from the ceiling. These two towers, both ready for immediate shipment, make up a "one-two punch" that can whip any water cooling problem in this range.

The AQUATOWER (cutaway view shown), a packaged steel cooling tower, completely assembled, ready-to-go. Open pan water distribution basin which is especially desirable for serving multiple air conditioning units. Interior coated with rubber to resist corrosion. Deep pitch, slow speed, quiet fan. Packed from top-to-bottom with heart quality redwood filling. Grease-packed ball bearings. Weatherproof motor. Request Bulletin AQ-50 for dimensions and ratings.

The SERIES 100 . . . a natural draft, all heart quality redwood tower, completely prefabricated and piece-marked for quick field erection. All bolted construction. Balanced spray system with Marley patented nozzles. Basin complete with fixtures—sump and float valve. Request Bulletin 100-50 for dimensions and ratings.

And that's not all of the one-two punch . . . these towers may be purchased on a combined discount schedule on Marley's Merchandising Plan. Your nearest Marley Application Engineer will be glad to explain this plan and show you how the Aquatower and Series 100 will solve economically any water cooling problem.

MAIL THIS COUPON TODAY

The Marley Company, Inc., Kansas City 15, Kansas

Please send me without cost or other obligation:

☐ Aquatower Bulletin AQ-50 ☐ Series 100 Bulletin 100-50

☐ Bring me up to date on Marley's new merchandising plan.

HV-5

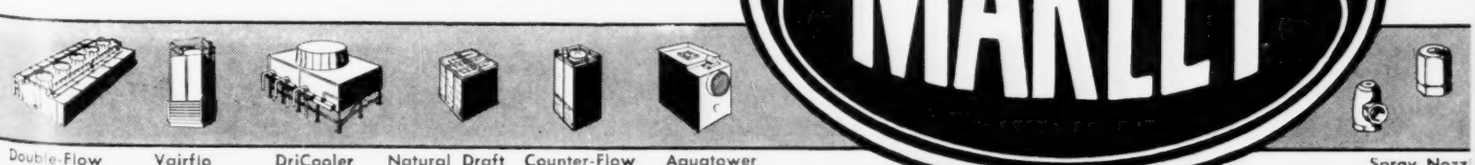
Name_____ Title_____

Company Name_____

Address_____

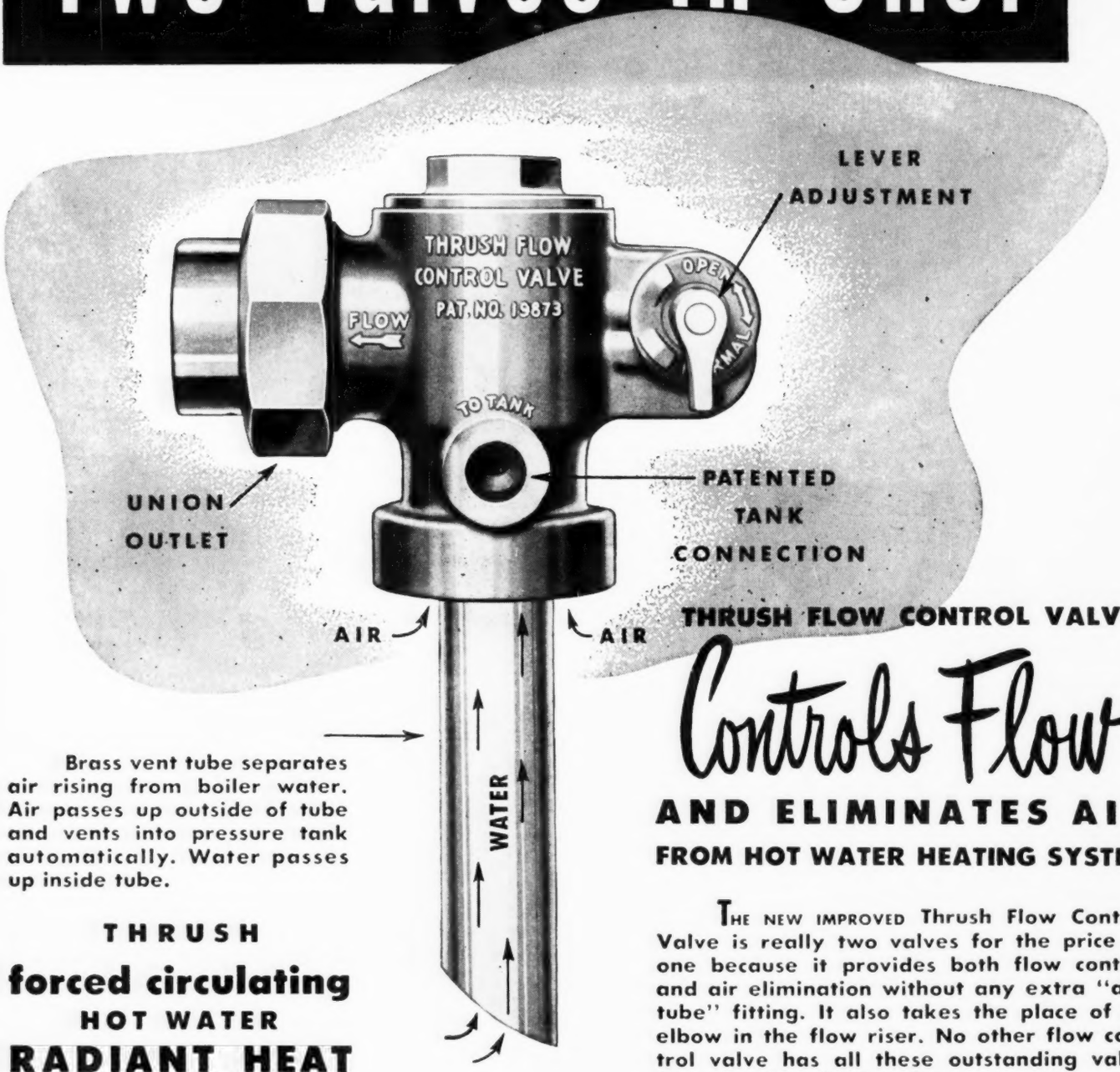
City_____ Zone____ State_____

MARLEY



Double-Flow Vairflo DriCooler Natural Draft Counter-Flow Aquatower Spray Nozz

Two Valves In One!



THRUSH FLOW CONTROL VALVE

Controls Flow

AND ELIMINATES AIR

FROM HOT WATER HEATING SYSTEM

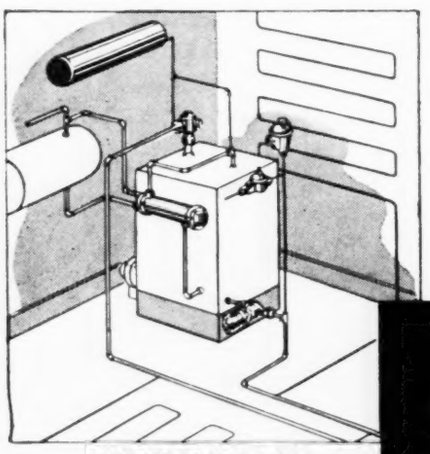
Brass vent tube separates air rising from boiler water. Air passes up outside of tube and vents into pressure tank automatically. Water passes up inside tube.

THRUSH

forced circulating
HOT WATER
RADIANT HEAT

THE NEW IMPROVED Thrush Flow Control Valve is really two valves for the price of one because it provides both flow control and air elimination without any extra "air-tube" fitting. It also takes the place of an elbow in the flow riser. No other flow control valve has all these outstanding value features. Get the facts now.

Highest boiler temperature occurs when the Flow Control Valve is closed. Air and gases which are liberated as the water is heated, vent directly into the pressure tank. Water which passes into the flow main, is always free of air. Result—greater heating efficiency—more uniform heat. You save material cost, save installation time, and reduce inventory requirements by specifying Thrush "T" Flow Control Valves. (They are also available without tube.) Ask your wholesaler for more information today or write Dept. D-5.



COMPLETE CONTROL FOR AUTOMATIC HOT WATER HEAT

H. A. THRUSH AND COMPANY

PERU, INDIANA

MANUFACTURER OF HOT WATER HEATING EQUIPMENT FOR MORE THAN A QUARTER CENTURY

"How's business, Mac?"

"Wonderful! I've got a money-maker in NORGE HEAT!"

A COMPLETE LINE
with each unit specially engineered
for GAS, OIL or COAL

Easier to sell. You will find that many customers *insist* on Norge Heat units. They already own one or more of the 185 Borg-Warner products. It is only natural that they associate high quality and dependability with Norge Heat.

Priced to sell. There's a Norge Heat unit for every home heating need. Priced right, every Norge Heat unit is a *money-maker.*

For complete details

. . . write today to Norge Heat, 672 E. Woodbridge, Detroit 26, Michigan.

NORGE HEAT
Division of Borg-Warner Corporation
Livings a treat with Norge Heat

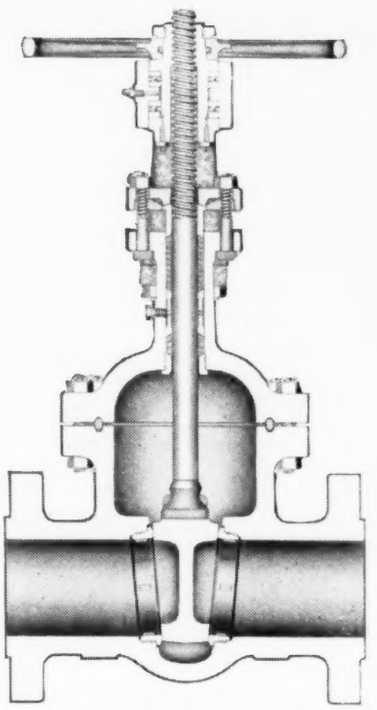
For the best in power piping...
Look to the complete CRANE line

STEEL VALVES FOR GENERAL STEAM SERVICES

You can count on Crane Cast Steel Wedge Gate Valves for dependable performance under the most severe service conditions. Straight-through ports minimize turbulence, erosion and resistance to flow. Long, close-fitting disc guides assure tight seating.

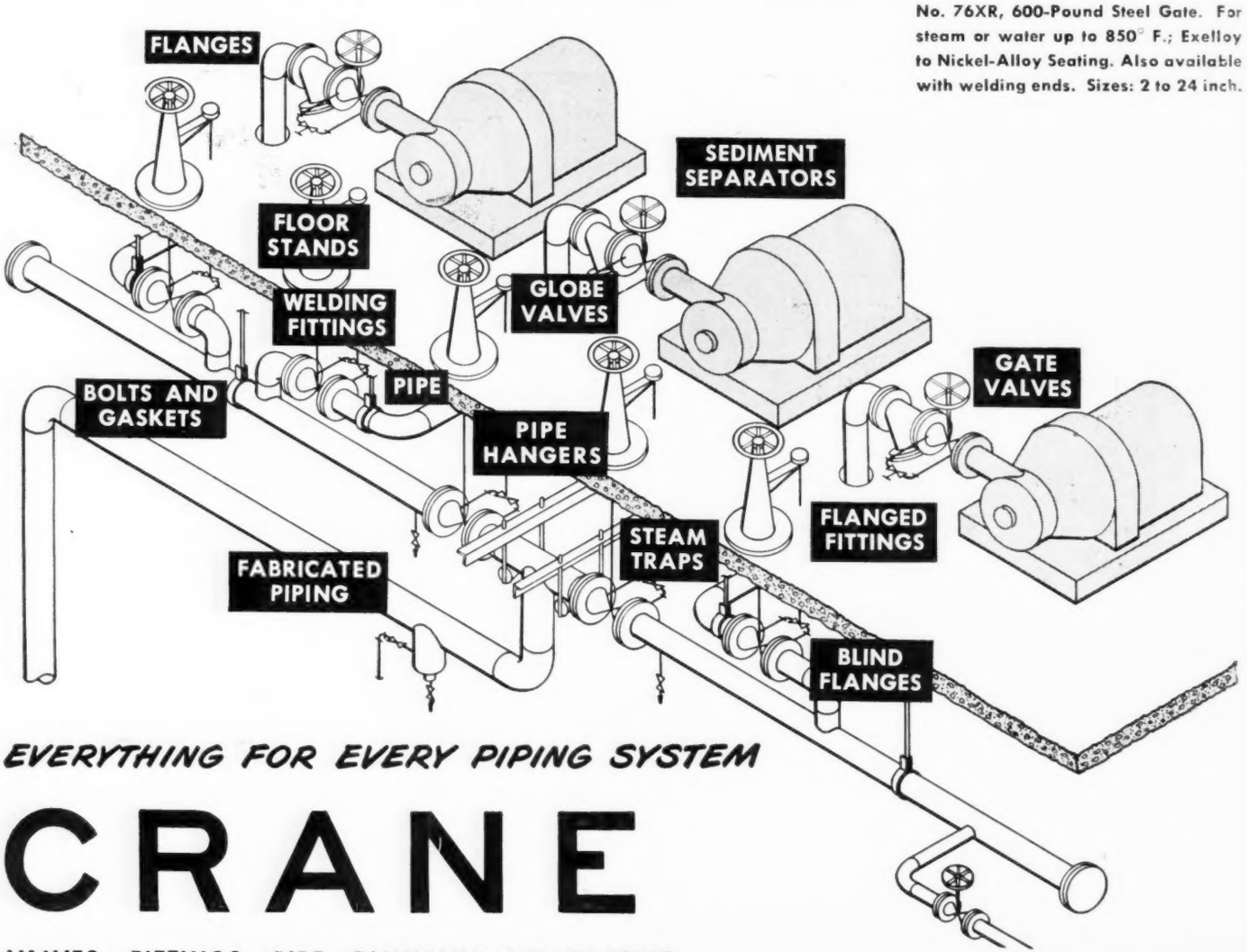
Strong tee-head disc-stem connection, easily lubricated yoke bushing, and ample bearings provide smooth operation. Made of Carbon or Alloy Steel suitably trimmed for pressures and temperatures up to 2500 pounds at 1000° F. Available with flanged, screwed, or welding ends. See your new No. 49 Crane Catalog.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas



No. 76XR, 600-Pound Steel Gate. For steam or water up to 850° F.; Exelloy to Nickel-Alloy Seating. Also available with welding ends. Sizes: 2 to 24 inch.

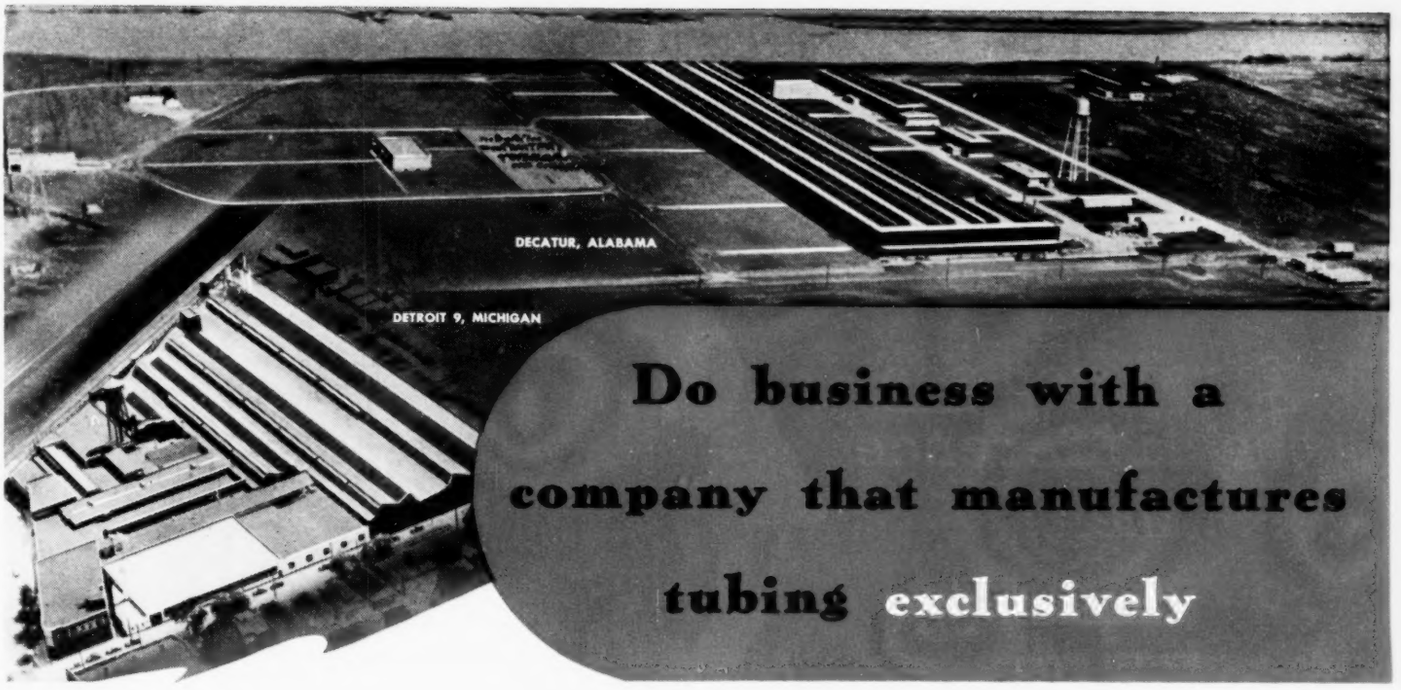
● THIS STEAM TURBINE PIPING INSTALLATION CAN BE 100% CRANE ON ONE PURCHASE ORDER



EVERYTHING FOR EVERY PIPING SYSTEM

CRANE

VALVES • FITTINGS • PIPE • PLUMBING AND HEATING



Do business with a company that manufactures tubing exclusively

You can be sure that a manufacturer who devotes all his efforts on the production of one type of product alone will give you the best that he is capable of offering you. Because he concentrates his skill and talents—research and experiments—capital and labor investment on the one purpose, he puts all his faith in the success of that pursuit. He faces a competitive market, as it were, with one "shot" of ammunition—and he knows "it better be good" if he expects to survive. He must depend upon that hope and confidence in his enterprise that his single effort will be rewarded by your acceptance of his product.

Tubing is the only product of Wolverine Tube Division. It has been our product for over a quarter century.

While never overlooking the possibility of making our product better, we are also giving much attention to ways and means of bringing you greater benefits in the use of tubing through Customers' Engineering Service.

Wolverine tube is produced under one quality-control from ore to finished product. You can buy this non-ferrous seamless tube with absolute confidence.

Send for literature about the application of tube in your particular field.

WOLVERINE TUBE DIVISION
Calumet & Hecla Consolidated Copper Company, Inc.

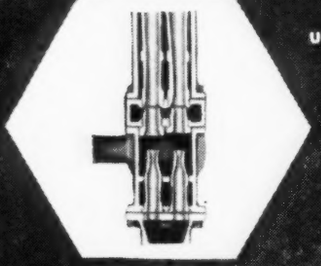
Manufacturers of seamless, non-ferrous tubing

1417 Central Avenue • Detroit 9, Michigan

Plants at Detroit, Mich. and Decatur, Ala.

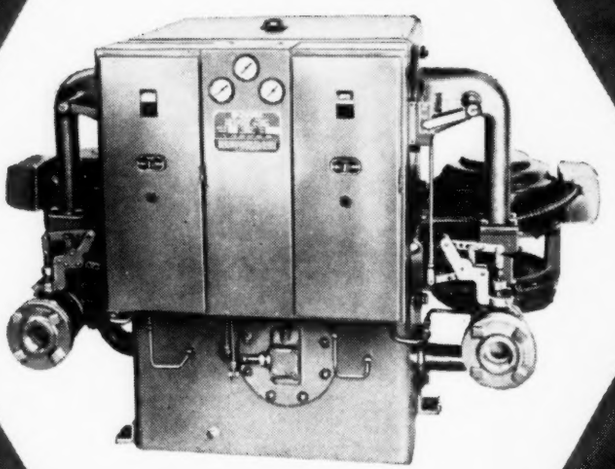
Stocks Available at All Wolverine Mill Depots:
DETROIT, MICH. • DECATUR, ALA. • HOUSTON, TEXAS
LOS ANGELES, CALIF. • LONG ISLAND CITY, N. Y.

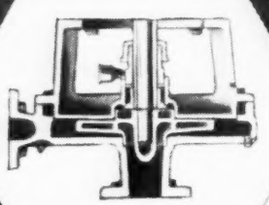
Sales Offices in Principal Cities



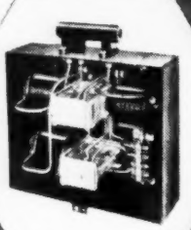
UNSURPASSED PERFORMANCE —Brass jet exhausters create high vacuum.

first you see the difference ...then you pocket it!





LOWEST COST MAINTENANCE —Simple water impeller eliminates all close tolerances.



UP TO 40% FUEL SAVING—Differential Controller varies vacuum up to 26 inches.

DUNHAM VACUUM PUMPS step up steam circulation... lower fuel costs. Your customers get more heat for their money when you install a Dunham Vacuum Pump. *Designed to pull up to 26 inches of vacuum,* these pumps easily handle the requirements of any steam heating system. Provide better circulation and control of steam . . . shorten "heating up" periods.

Dunham Vacuum Pumps are extremely simple and compact in design. The only principal moving element is the water impeller. Flow of water through the exhauster jets creates high vacuum . . . maintains positive pressure to discharge condensate direct to boiler. There are no moving parts under vacuum . . . no close tolerance parts to slip out of adjustment.

Available as single or duplex units—in a full range of capacities to meet most heating demands. Dunham Vacuum Pumps are ready for immediate operation on delivery.

These Pumps Help Dunham Differential Heating Cut Fuel Costs up to 40%

These pumps are the heart of the famous Dunham Vari-Vac* Heating System . . . the precision temperature control system that, for example, has enabled the Millard Fillmore Hospital, Buffalo, N. Y., to save 37.8% annually on steam consumed since 1935.

SEND FOR THIS FREE BULLETIN!

Write today for your free copy of File No. 4C-2-8, giving complete facts and figures about these cost-saving Vacuum Pumps and other Dunham Heating Products. C. A. Dunham Co., 400 W. Madison St., Chicago 6, Ill. *In Canada:* C. A. Dunham Co., Ltd., Toronto. *In England:* C. A. Dunham Co. Ltd., London. *Sales Engineers and Jobbers in All Principal Cities.*

**Variable Vacuum*

FROM A SINGLE TRAP . . . TO A COMPLETELY ENGINEERED SYSTEM . . .

DUNHAM

HEATING MEANS BETTER HEATING

demand DETROIT CERTIFIED CONTROLS

Millions Have Now Met Detroit's "Thermostat with a Brain"!

INTRODUCING GREAT NEW PROFIT POSSIBILITIES FOR YOU!

Now is the time for you to take advantage of this great sales opportunity! National advertising by DETROIT has made millions of home owners and home builders the country over. *Timed Cycling* conscious! By selling the full line of DETROIT controls with the remarkable *Timed Cycling* Room Thermostat, you can give your customers the assurance of fuel economy and perfect heat control by the elimination of over and under heating! Moreover, DETROIT controls are the *only* ones certified for reliability, performance, and engineering excellence! So order your supply today—they will bring greater comfort to your customers and greater profits to you!

Look for this Certificate — only Authorized DETROIT *Wholesalers sell certified Controls.*

DETROIT
LUBRICATOR COMPANY

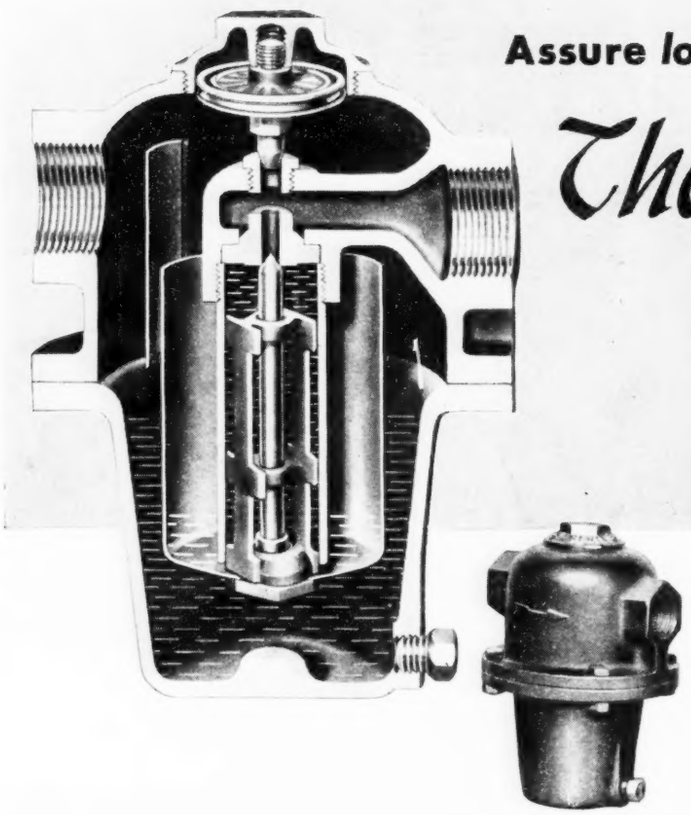
5900 TRUMBULL AVE., DETROIT 8, MICHIGAN
Division of American Radiator & Standard Sanitary Corporation
Canadian Representatives: RAILWAY & ENGINEERING SPECIALTIES, LTD.—Montreal, Toronto, Winnipeg

"DETROIT"

DETROIT HEATING AND REFRIGERATION CONTROLS • ENGINE SAFETY CONTROLS • FLOAT VALVES AND OIL BURNER EQUIPMENT • DETROIT EXPANSION VALVES AND REFRIGERATION ACCESSORIES • STATIONARY AND LOCOMOTIVE LUBRICATORS

Serving home and industry AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

ILLINOIS
Float & Thermostatic TRAPS



Assure *lower* return line temperatures

They're different!

–in construction

–in performance

ILLINOIS Float & Thermostatic Traps operate under vacuum with the same high efficiency as under pressure. No more water-logging of mains . . . no more air binding . . . end "morning overload" troubles. The instantaneous action of the condensate valve assures complete drainage of condensate. A separate thermostatically controlled valve vents air continuously in large volume, yet positively prevents loss of steam.

Recommended Applications

Low Pressure Heating Systems, Ventilating Units, Unit Heaters, Pre-Heaters, Re-Heaters, and other Fan System Heat Surface, Large Radiators or Pipe Coils, Hot Water Generators, Drips of Mains and Risers. Draining Coffee Urns, Warming Tables, Pasteurizers, Vacuum Pans, Heat Exchangers, Process Heaters, Sterilizers, Autoclaves, Cooking Kettles, Kilns and similar equipment.

(For operating ranges from 25 inches vacuum to 15 pounds pressure use Series G Traps. For pressures up to 50 pounds use Series MG.)

Rated capacities of various size traps from 200 pounds to 5000 pounds condensate per hour, at 2 pounds differential across the trap.

Positive, Instantaneous Valve Action . . . an Exclusive Feature

The Snap Action of the Condensate Control Valve assures efficient trap operation. The valve is not directly attached to float but is actuated by impact of the dropping float. Valve action is instantaneous whether the trap is handling its maximum capacity or only a trickle of condensate and regardless of variation in pressures. The valve is either wide open or tight shut—never cracked on seat, never hanging in an intermediate position. It is water-sealed at all times. It cannot chatter and is never affected by pulsations in the flow of condensate to the trap.

Simple, Compact, Trouble-proof

No ball floats to puncture or collapse—no toggles, pins, levers or hinges to corrode, stick or bend. Hard, stainless alloy steel renewable valves and seats are used for both condensate and air bypass units. Both valve units are at the top of trap out of dirt and sludge, assuring long life and satisfactory operation without attention. Straight through connections save head room, fittings, trenching, labor, and avoid low hung piping or lifts. Trap is easily opened for inspection without disturbing piping.

TRAP NOT DAMAGED BY FREEZING. Freezing will not harm this trap in any way and it is self-thawing.

Write for Bulletin 34-C

ILLINOIS ENGINEERING COMPANY
INCORPORATED 1900
RACINE AVENUE AT 21ST STREET • CHICAGO 8

Engineers, contractors, users

Demand this Assurance

OWENS-CORNING
FIBERGLAS
COATED DUCT INSULATION
OWENS-CORNING FIBERGLAS CORPORATION • TOLEDO 1, OHIO
Underwriters' Laboratories, Inc.
INSPECTED
BUILDING MATERIAL
FIRE HAZARD CLASSIFICATION
(Based on 100 for untreated red oak)
FIRE SPREAD . . . . . 10 - 20
FUEL CONTRIBUTED . . 10 - 15
SMOKE DEVELOPED . . Negligible

Fiberglas* Coated Duct Insulation has it!

Listing by the Underwriters' Laboratories, Inc. is another *first* for Fiberglas Coated Duct Insulation. Based on their tests it is now universally accepted by insurance interests as a *fire retardant* material . . . also no panic hazard, no toxic fumes because smoke developed is negligible.

To users of Fiberglas Duct Insulation, especially in concealed spaces, this means *impartial* assurance of greater property fire protection . . . more lasting protection because of the natural properties of the basic material, ageless fibers of glass.

Get complete information and data sheets on Fiberglas Duct Insulation by phoning the local Fiberglas Sales Office in leading cities. Or write to OWENS-CORNING FIBERGLAS CORPORATION, Dept. 41-E, Toledo 1, Ohio.

OWENS-CORNING
FIBERGLAS
THERMAL INSULATING MATERIALS

*Fiberglas is the trade-mark (Reg. U.S. Pat. Off.) for a variety of products made of or with glass fibers by Owens-Corning Fiberglas Corporation.

FIBERGLAS IS IN YOUR LIFE . . . FOR GOOD!

Nothing heats better than Modine Convector Radiation . . . NOTHING LOOKS MORE BEAUTIFUL IN A BEAUTIFUL ROOM

To find out why the new Modine Convector is the *better* way to heat apartments, homes, schools, offices or hospitals, call your Modine Representative. He's listed in the "Where-to-Buy-it" section of your phone book. Ask to see a sample, or write direct. Modine Mfg. Co., 1511 Dekoven Avenue, Racine, Wisconsin.

Send for New Modine Convector Catalog Today!
Special 1-Pipe Steam Convector Bulletin Also Available.

Design and Mechanical Patents Pending

Modine
CONVECTORS

R-1048

FLIP FOLD FOR STAYNEW'S EXCLUSIVE FEATURE

Staynew AUTOMATIC AIR FILTERS

First in

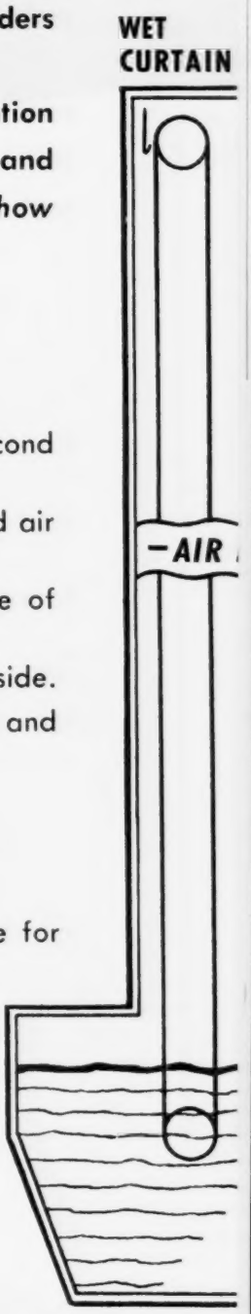
- **LOW INITIAL COST**
- **HIGH OPERATING EFFICIENCY**
- **LOW MAINTENANCE COST**

In factories, office buildings, institutions and commercial establishments, Staynew Automatics give better results at less cost . . . as proven by the steadily increasing number of modern builders who specify Staynews exclusively.

If your building problem requires the filtration of large volumes of dirty air at high efficiency and low cost, let Staynew engineers show you *how* and *why* Staynews are your answer.

No Other Air Filter Can Give You These 10 Important Features

1. *Double* filter curtains—the first wet, the second dry. No oil entrainment.
2. Cleaned side of curtains always on filtered air side.
3. Highest efficiency of any mechanical type of self-cleaning filter.
4. Motor and controls mounted on clean air side.
5. Momentary contact time switch for testing and checking.
6. Shear pin protection of moving parts.
7. Remote mounting of control unit if desired.
8. Gear and roller chain drive.
9. Compressed air curtain cleaners available for special conditions.
10. Nationwide service on motor and controls.



WRITE FOR SPECIAL BULLETIN LHS
providing complete information, including capacity, dimension, and performance data.

DOLLINGER CORPORATION
60 CENTRE PK., ROCHESTER 3, N. Y.

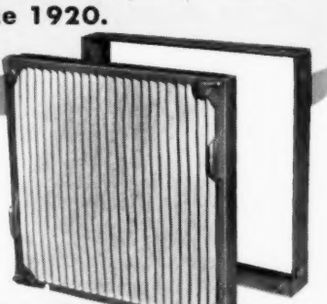
DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

STAYNEW
PANEL FILTERS

Dry-Type ★ Viscous-Type

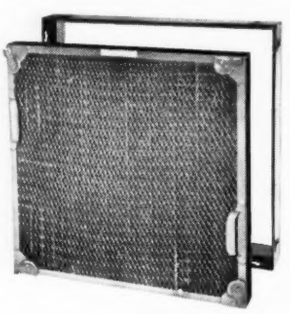
designed for a broad range of prices and applications

Simple, efficient designs and rugged construction are featured. Most types provide for cell and frame assemblies, with heavy, serviceable handles and powerful cam-type locking latches. 18-gauge steel is used throughout. Supporting frames are so designed and drilled that they can be riveted together to form a flat bank. By the addition of angles, a series of "V's" can be formed. All models typify the high efficiency and low maintenance cost for which Staynew Filters have been famous since 1920.



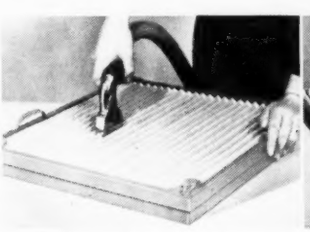
MODEL PVG
VENTILATION FILTER . . .

● A low-cost, permanent, washable type filter. Designed for maximum use of medium with minimum of weight. Exclusive Staynew "RL" steel medium causes rapid changes in air direction and holds heavier particles. Finer particles are held by corrugated screen cloth and, as a final stage, layers of fine woven copper mesh. 2″ and 4″ units available.

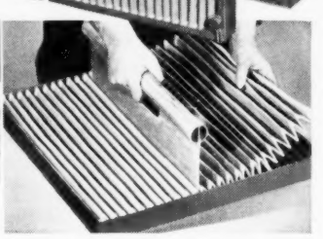


Cross Section of Medium

MODEL WKE
VENTILATION FILTER . . .



Easy to clean by vacuum



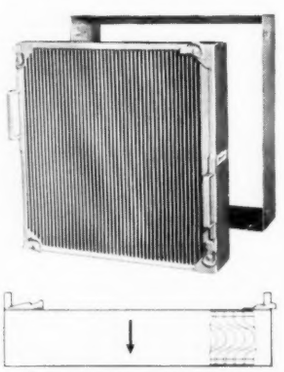
Filtering medium replaceable at low cost

Staynew Vacuum Cleaning Nozzle

Especially designed for heavy duty industrial applications. "V" construction provides large filtering area in small space. Wide variety of media available. Cleaning simple and easy with Staynew Saddle-type Vacuum Cleaning Nozzle. 2″ and 4″ deep units available. Fire Underwriters Class I Approved when used with B-G Medium.

MODEL SPB
SPRAY BOOTH FILTER . . .

DRY OR VISCOUS DEPENDING ON KIND OF PAINT USED. Removes paint spray particles from the ventilation air stream by means of a series of scientifically designed baffles. These baffles cause rapid changes in direction of air-flow and consequent impingement of particles, which collect and drain to the bottom of the unit.

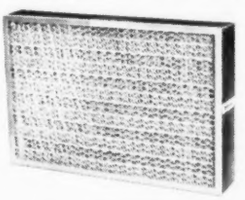


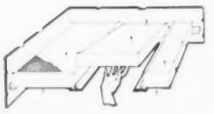
Cross Section of Medium

NEW! MODEL PVR
KITCHEN RANGE FILTER

Solves the problem of grease collection in exhaust hoods over ranges, steam tables or cookers. Eliminates fire hazard and odorous, unsanitary conditions. Exclusive Staynew "RL" steel filtering medium. Available in 3″ deep units. *Lowest cost high grade range filter.*

Panels easily removed for cleaning in hot, soapy water. Automatic dishwashing machine ideal for this purpose.





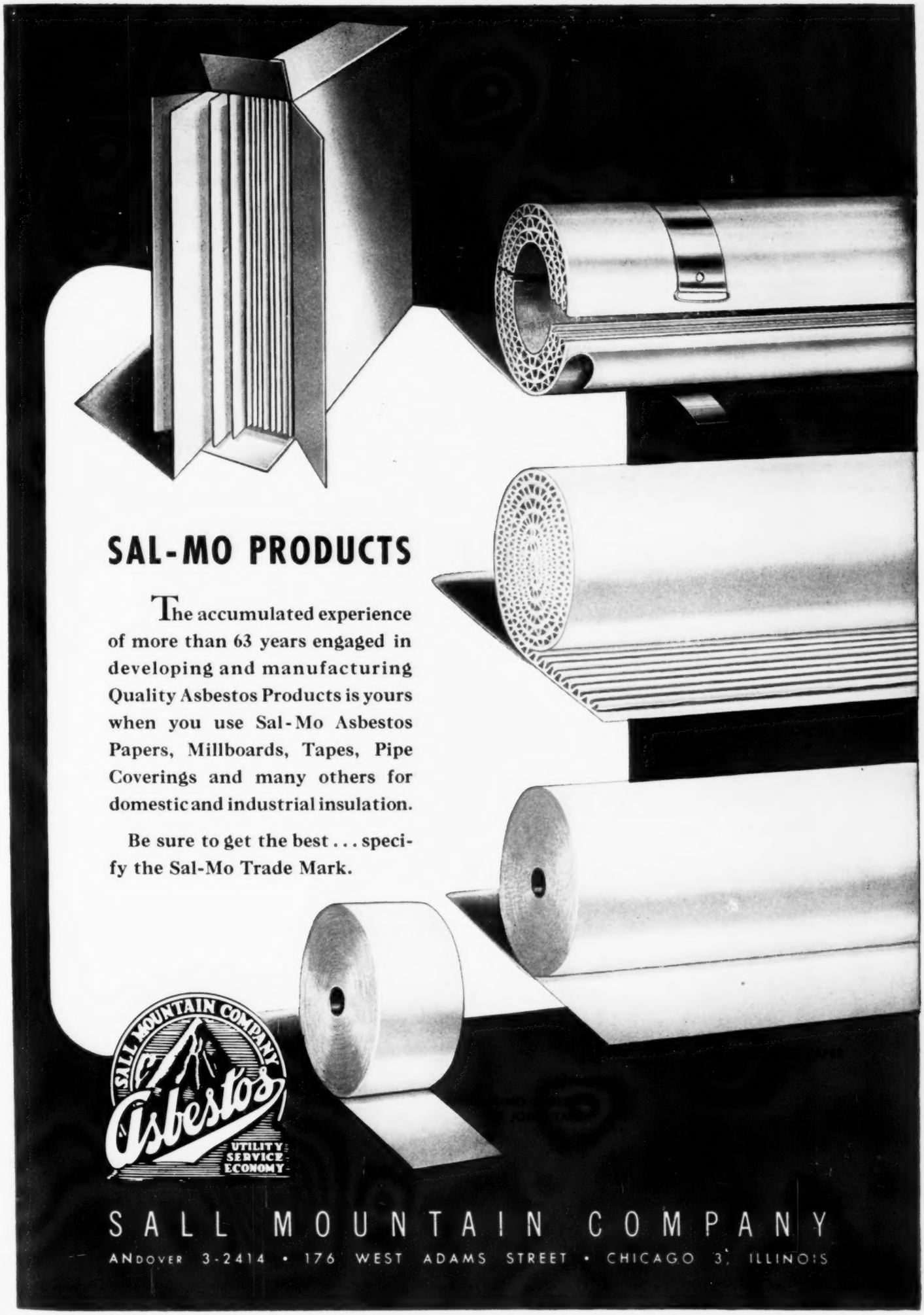
Representatives in Principal Cities

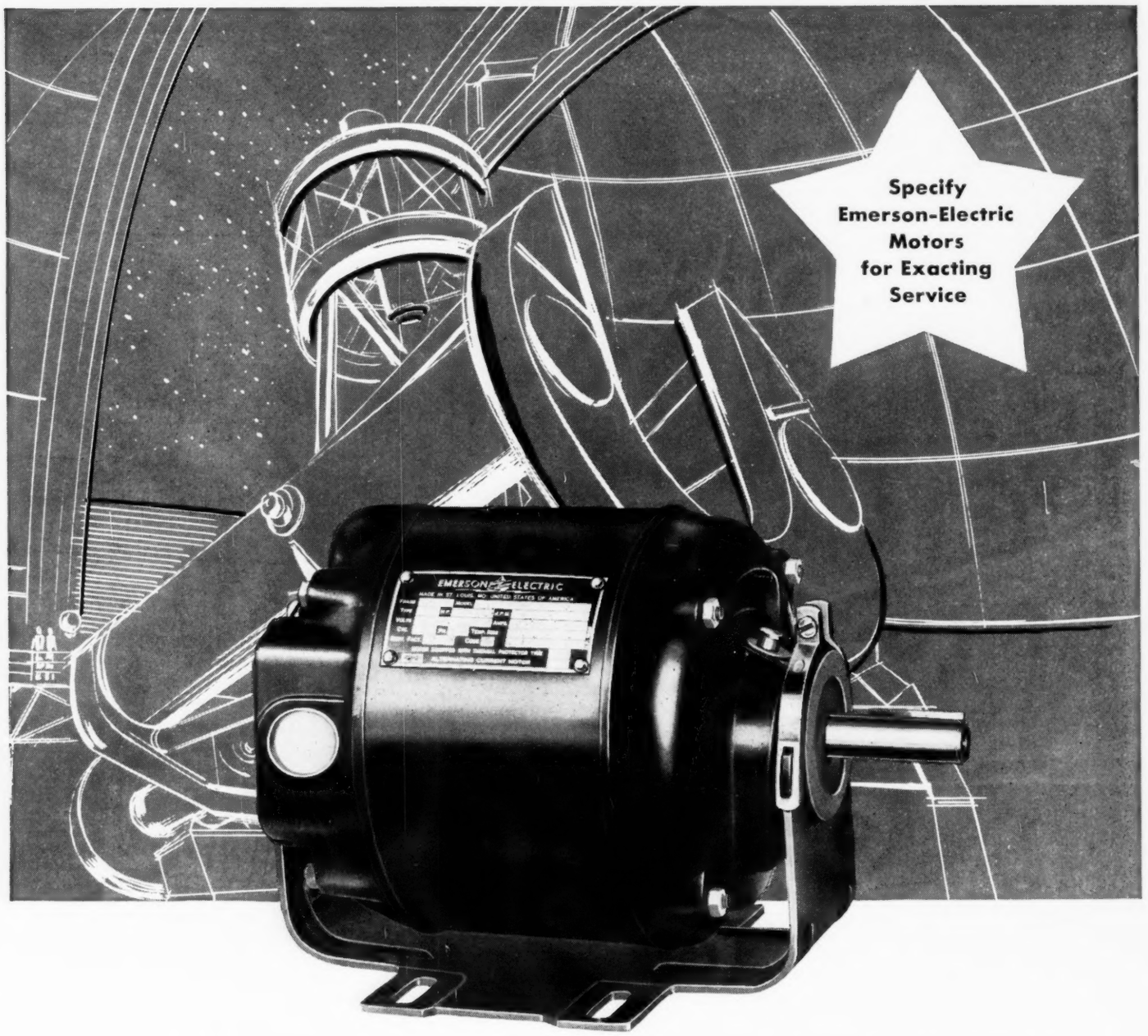
★

Write for Complete Data, Mentioning Special Interests

DOLLINGER CORPORATION, 60 Centre Pk., Rochester 3, N. Y.

DOLLINGER PROTECTOMOTOR STAYNEW FILTERS


SAL-MO PRODUCTS
The accumulated experience of more than 63 years engaged in developing and manufacturing Quality Asbestos Products is yours when you use Sal-Mo Asbestos Papers, Millboards, Tapes, Pipe Coverings and many others for domestic and industrial insulation.
Be sure to get the best . . . specify the Sal-Mo Trade Mark.
SALL MOUNTAIN COMPANY
Asbestos
UTILITY
SERVICE
ECONOMY
SALL MOUNTAIN COMPANY
ANDOVER 3-2414 • 176 WEST ADAMS STREET • CHICAGO 3, ILLINOIS



Precision Built . . . for Star Performance

Write for these Emerson-Electric Motor Data Bulletins

Appliance and equipment manufacturers, with applications for motors of 1/20 to 5 h.p., can profitably use these authoritative reference guides. Specifications, construction details and performance data are included for the following types:

- ☐ No. 345-A Capacitor-Start Motors
- ☐ No. 345-B Split-Phase Motors
- ☐ No. 345-C Integral Motors
- ☐ No. 345-D Fan-Duty Motors
- ☐ No. 345-E Oil-Burner Motors
- ☐ No. 345-F Jet Pump Motors
- ☐ No. 345-G Blower Motors

You cannot compare the relative differences of the stars with the naked eye. So, too, with competitive products. Externally they may appear similar, yet one far outsells the other because of efficient, long-term performance. The motor you select, can give or deprive your equipment of an important sales advantage.

Knowing that the reputation of its motors is mirrored in the products they power, Emerson-Electric continues its 60-year policy of exhaustive research, scientific design engineering and precision production. Result, scores of America's best known products are Emerson-Electric Motor equipped.

Get the facts. If you have motor requirements in the 1/20 to 5 h.p. range, Emerson-Electric Motors deserve your investigation. Your inquiry is invited.

THE EMERSON ELECTRIC MFG. CO.
ST. LOUIS 21, MO.

EMERSON ELECTRIC
MOTORS • FANS APPLIANCES

BRUNNER SINCE 1906

AIR CONDITIONING builds business

WHAT'S KEEPING YOU AWAY

from Air Conditioner Profits?

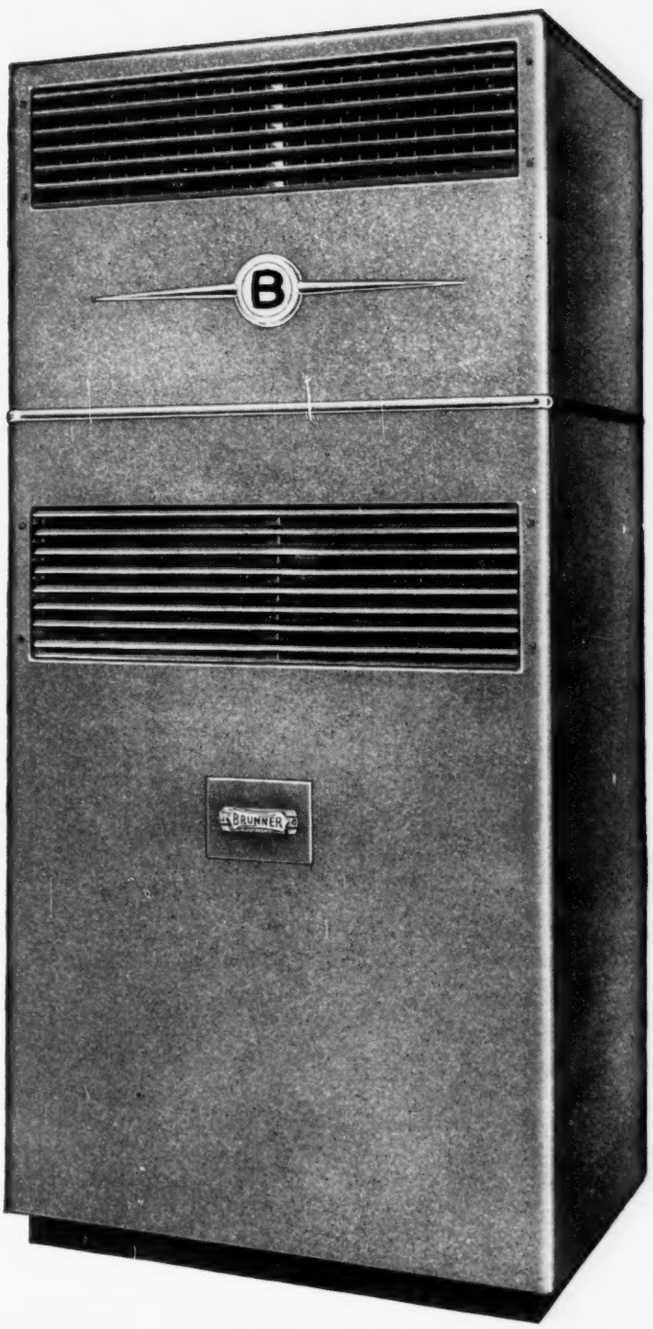
PRODUCT? Brunner self contained floor type room air conditioners are available in 4 popular sizes—3, 5, 7½ and 10 ton. Completely Brunner built...backed by 44 years of engineering "know how." *By every standard of comparison an outstanding product worthy of your confidence.*

INVOLVEMENT? Packaged air conditioning is simple to sell, install and service. No involved technical knowledge is required. Recommendations are determined through a few easily figured facts. Packaged air conditioning is a natural part of any refrigeration and appliance business.

SALES HELP? Brunner field-sales engineers are so located across the country as to be readily available to help on every occasion when called upon. Brunner advertising to "users" in many fields has paved the way to recognition and acceptance of Brunner as the top value in air conditioning.

MARKETS? All around you! Practically every business depending upon store traffic, wants and needs air conditioning. The opportunities are legion. The Brunner field man will show you how to contact and close sales.

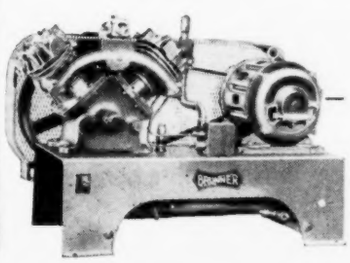
PROFIT? Brunner Air Conditioning builds business ...yours and your customer's. Don't let this extra income pass you by. Write or wire for a Brunner representative to spread the facts before you. You can't miss recognizing the superiority of Brunner Air Conditioners as a product and as a *new business* opportunity.



BRUNNER SINCE 1906

AIR CONDITIONING

- **Self Contained 3 HP. to 10 HP.**
- **Remote Type 5 HP. to 75 HP.**



BRUNNER MANUFACTURING CO., Utica 1, New York, U.S.A.

REFRIGERATION CONDENSING UNITS by BRUNNER

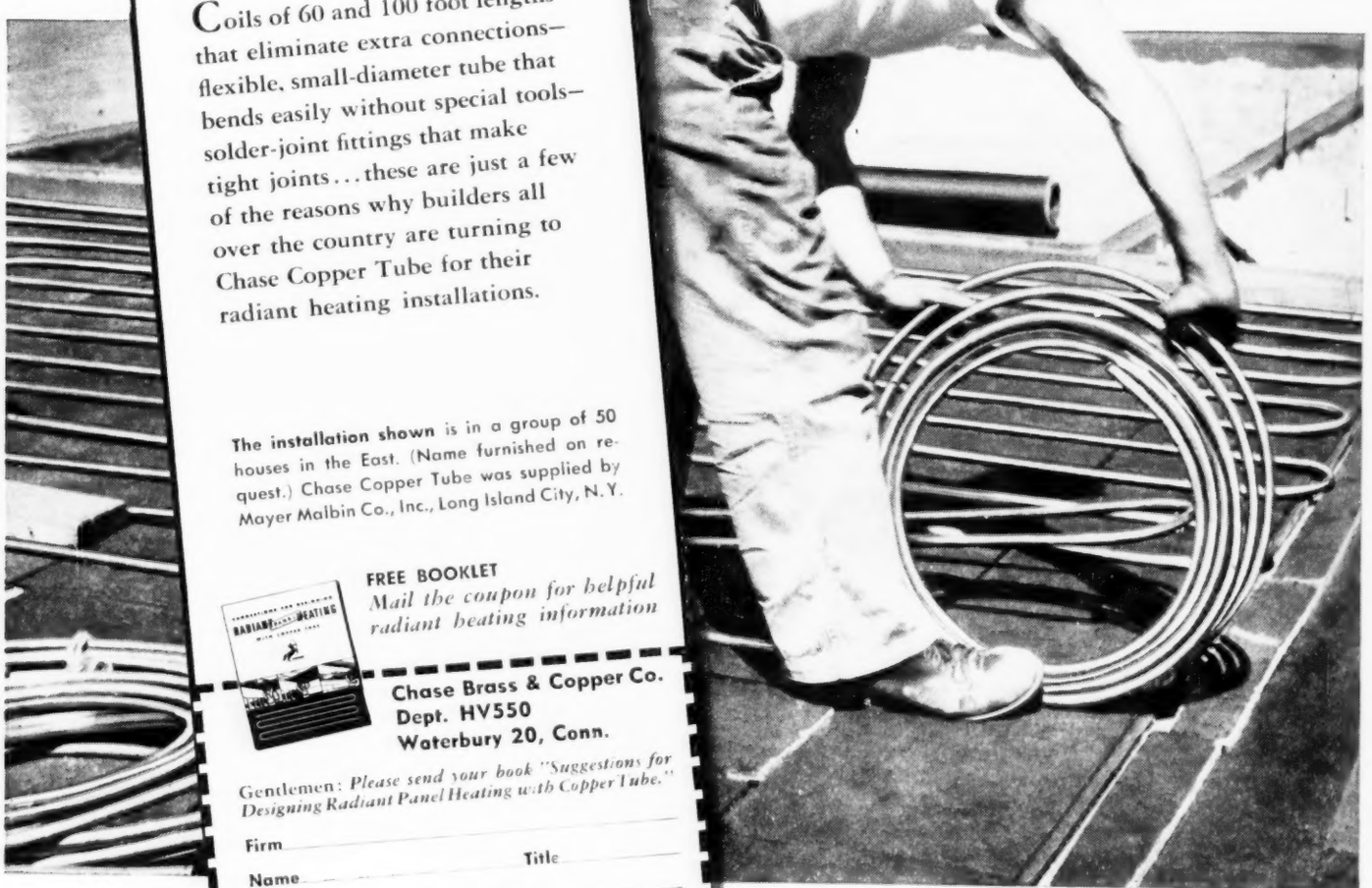
AIR AND WATER COOLED MODELS—*a size and type for every purpose...*¼ **HP. TO 75 HP.**

BRUNNER SINCE 1906

CHASE COPPER TUBE RADIANT HEATING goes into still another group of homes!

Coils of 60 and 100 foot lengths that eliminate extra connections—flexible, small-diameter tube that bends easily without special tools—solder-joint fittings that make tight joints... these are just a few of the reasons why builders all over the country are turning to Chase Copper Tube for their radiant heating installations.

WHEN *you* plan radiant heating installations, remember that Chase Copper Tube can be installed easily, economically. Its light weight simplifies the handling of the long coils. Its small diameter adapts it perfectly to ceiling installation in the normal plaster depth. *And*... Chase Copper Tube is available for immediate delivery!



The installation shown is in a group of 50 houses in the East. (Name furnished on request.) Chase Copper Tube was supplied by Mayer Malbin Co., Inc., Long Island City, N.Y.

FREE BOOKLET
Mail the coupon for helpful radiant heating information

Chase Brass & Copper Co.
Dept. HV550
Waterbury 20, Conn.

Gentlemen: *Please send your book "Suggestions for Designing Radiant Panel Heating with Copper Tube."*

Firm_____

Name_____ Title_____

Street_____

City_____ State_____

Chase

WATERBURY 20 CONNECTICUT

the Nation's Headquarters for
BRASS & COPPER

SUBSIDIARY OF KENNECOTT COPPER CORPORATION

THIS IS THE CHASE NETWORK . . . *handiest way to buy brass*

ALBANY† ATLANTA BALTIMORE BOSTON CHICAGO CINCINNATI CLEVELAND DALLAS DENVER† DETROIT HOUSTON† INDIANAPOLIS KANSAS CITY, MO. LOS ANGELES MILWAUKEE MINNEAPOLIS NEWARK NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH PROVIDENCE ROCHESTER† ST. LOUIS SAN FRANCISCO SEATTLE WATERBURY (†Sales Office Only)

HANDSOME IS AND HANDSOME DOES

Gene Boyle's Restaurant, Clifton, N. J. • **Architects:** Shulman & Gurtman, Paterson, N. J. • **Contractor:** B. B. Rider Corp., Passaic, N. J.

...when you specify **kno·draft** adjustable air diffusers

Handsome is . . . the way Kno-Draft *Adjustable* Air Diffusers integrate with *any* decorative theme . . . as soft contrasts in their natural aluminum or, as in the picture above, blended by painting to match the ceiling.

And handsome does . . . a superlatively efficient job of distributing the air to meet *any* desired pattern of flow . . . assuring equalized temperature and volume—*without draft*—throughout the conditioned area.

With Kno-Draft Air Diffusers, both air volume and direction can be adjusted and controlled *after installation*—an important feature. There are models and sizes for every need.

KNO-DRAFT DATA BOOK: Complete specifications, engineering and installation data on Kno-Draft *Adjustable* Air Diffusers. To get your copy, simply fill in and mail the coupon. No obligation, of course.

W. B. CONNOR ENGINEERING CORP.
114 East 32nd Street, New York 16, N. Y.
Air Diffusion • Air Purification • Air Recovery
In Canada: Douglas Engineering Co., Ltd.,
190 Murray Street, Montreal 3, P. Q.

W. B. CONNOR ENGINEERING CORP.
Dept. J-50, 114 East 32nd Street, New York 16, N. Y.

Please send me, without obligation, my copy of the Kno-Draft Air Diffuser Data Book.

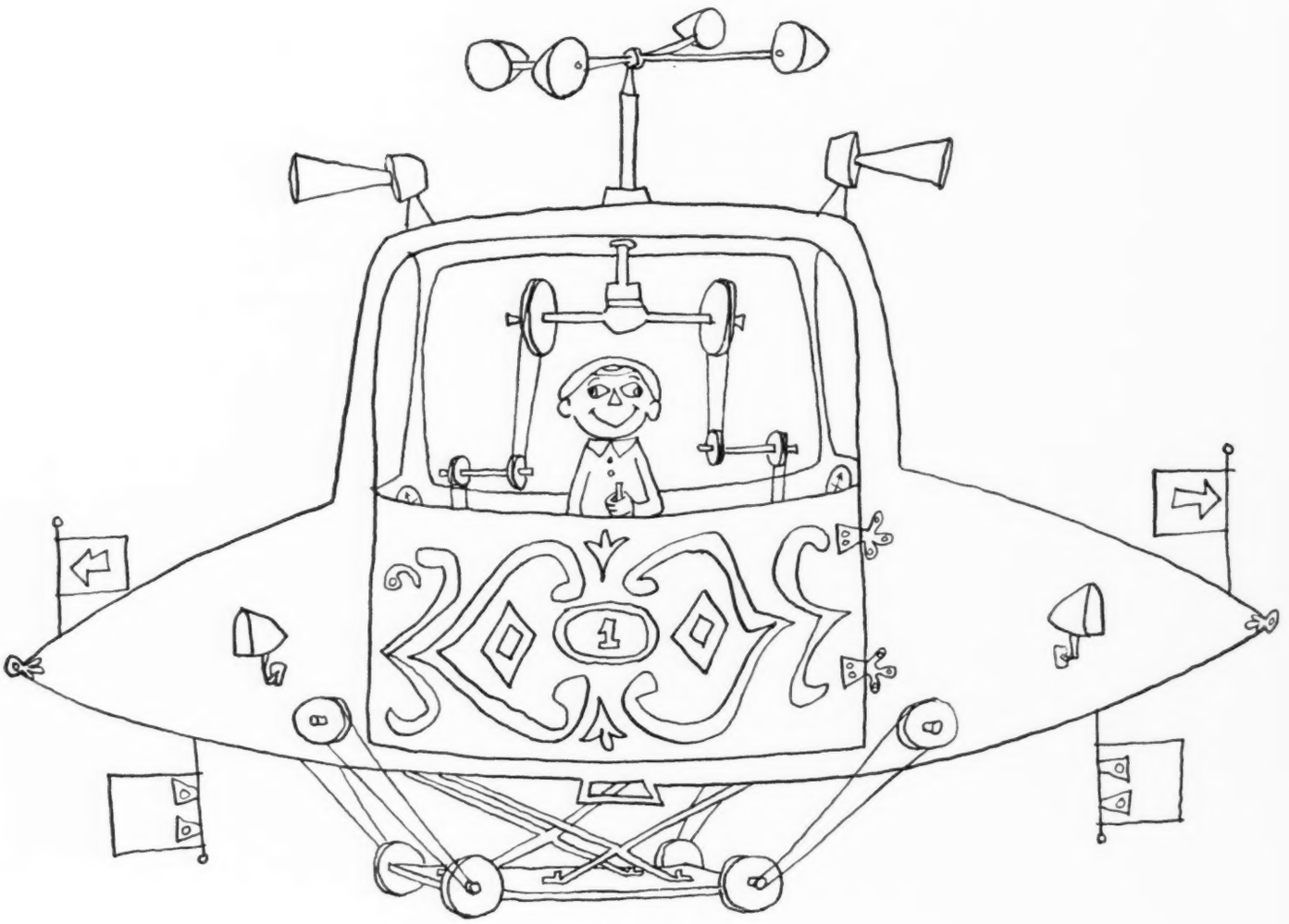
Name.....

Position.....

Company.....

Street.....

City.....**Zone**....**State**.....



Will it run?

Of course. The inventors are unanimous. Which way? W-e-l-l. *That* they *can't* agree on.

Just the same, this invention has its uses. For instance, it's a perfect example of the dangers of divided responsibility.

It's the sort of thing you avoid when you specify Carrier all the way for air conditioning, refrigeration or industrial heating. Only when the installation is completely Carrier can you be completely sure.

That's our advice. Take it and nobody will ever say about one of your projects . . . "Will it run?"

The best recipe for years of satisfaction is Carrier. Carrier founded air conditioning. Every significant advance in air conditioning from its birth has come from Carrier. These are a few of the many Carrier products all of which will fit your needs best: Conduit and Duct-type Weathermaster Systems for the multi-room building; Evaporative Condensers; Central Air Conditioners; Dehumidifiers; Self-contained Air Conditioners; Reciprocating, Centrifugal and Absorption Refrigeration Machines; Cold Diffusers and Heat Diffusers. Carrier Corporation, Syracuse, New York.

Carrier AIR CONDITIONING · REFRIGERATION · INDUSTRIAL HEATING

Whose job is it to keep them smiling?

Your path and that of the Smiths never may cross. They don't buy your services. Yet, you *can* help make them better customers of your clients!

When you put dependable Bryant gas heating into industrial plants, you help increase production, lower selling prices. When you install Bryant equipment in retail stores, shoppers stay longer, buy more. Thus, you actually influence spending of the Smith budget.

Then, too, the Smiths become happy tenants of the apartment-owning client to whom you sold Bryant individual suite heating. They are willing to pay higher rentals, less inclined to move when they have that reliable Bryant heating.

True, it's not *your* job to keep the Smiths smiling. But, whenever you install Bryant equipment, you help make more loyal customers for *your* customers!

Let the pup be furnace man
... and water boy, too!

bryant

AUTOMATIC HEATING

The most complete line of gas heating equipment in the nation

Bryant Heater, Dept. 143,
17825 St. Clair, Cleveland, Ohio

( ) Send me the new booklet that tells the Bryant story. ( ) Have your distributor call on me.

Name_____

Company_____

Address_____

City_____ State_____

For more information on products advertised, use Inquiry Card, page 97

DRY-EX WATER CHILLERS

ACME PRODUCTS

Acme

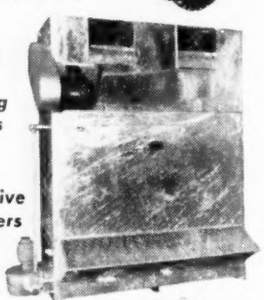
Designed For Ammonia or Freon

Acme Dry-Ex Water Chillers are provided in standard designs for all water ranges and quantities and for the full range of capacity requirements. They can be used with direct expansion ammonia as well as Freon for air conditioning systems and general industrial applications. Years of experience—with extra features and improvements—make Acme Dry-Ex Water Chillers outstanding for maximum performance and minimum service.

Heads are cast steel, shell is seamless steel tubing. Tubes are seamless copper (steel and alloy tubes available on special order). Built to comply with ASME Codes. To be safe, specify ACME—select from a wide variety of types and sizes shown in our Catalog No. 631.

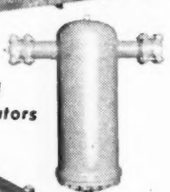
Dry-Ex Water Chillers

Freon and Ammonia Condensers

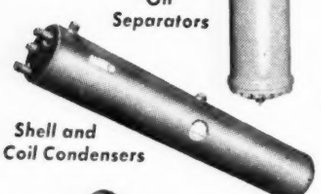


Forced Draft Cooling Towers

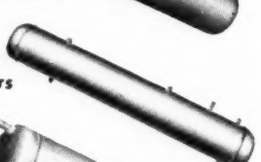
Evaporative Condensers



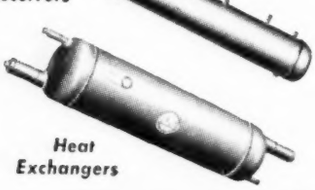
Oil Separators



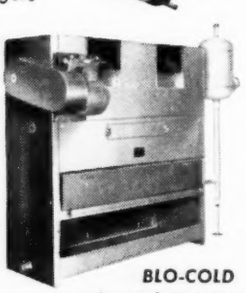
Shell and Coil Condensers



Liquid Receivers

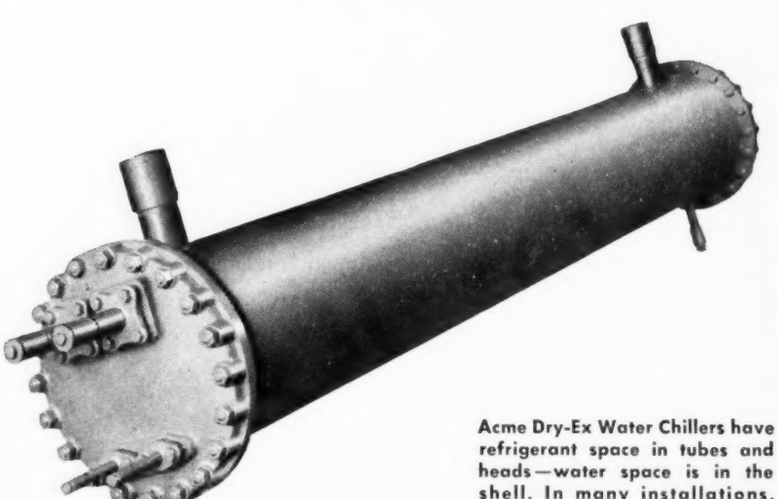


Heat Exchangers



Pipe Coils

BLO-COLD Industrial Unit Coolers



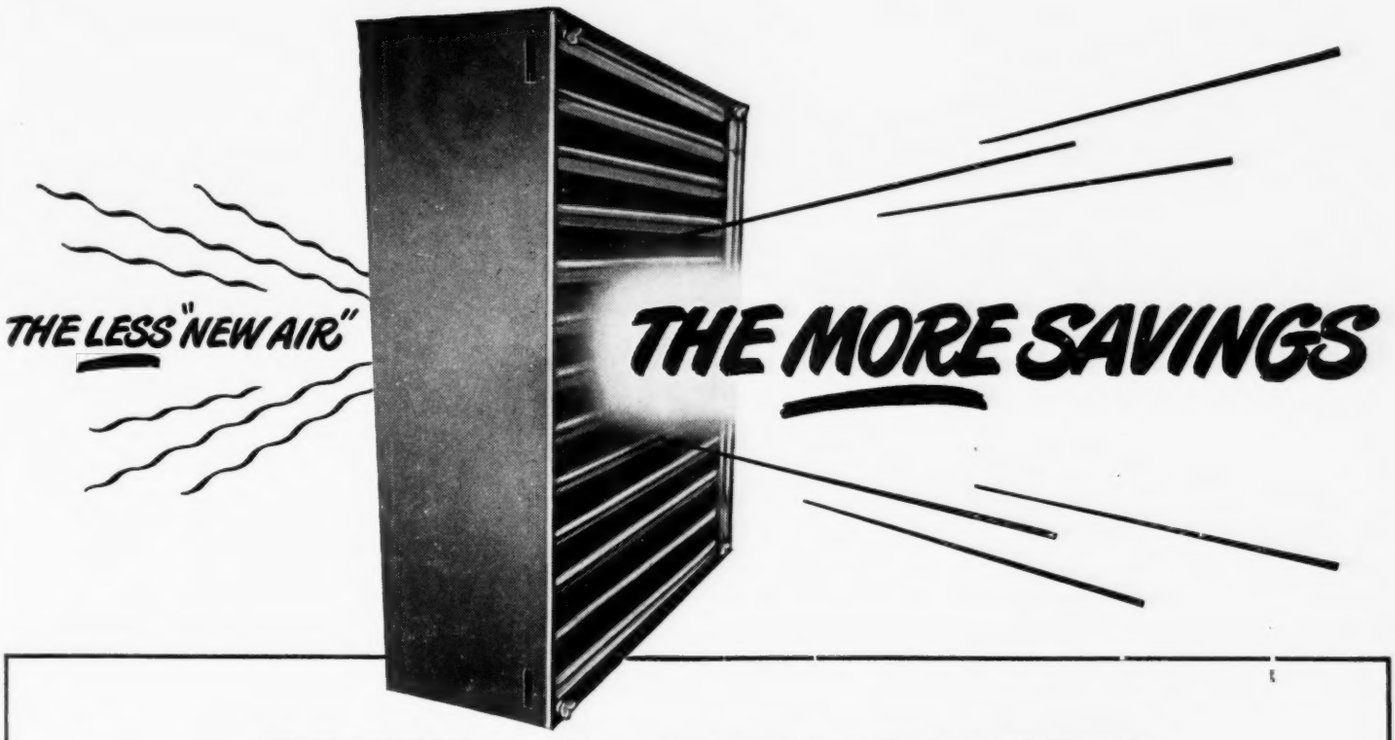
Acme Dry-Ex Water Chillers have refrigerant space in tubes and heads—water space is in the shell. In many installations, savings in initial refrigerant charge will more than offset any additional chiller cost over that of flooded units. Model shown is DXG.

ACME INDUSTRIES INC.

Jackson, Michigan

Representatives in principal cities

Serving the refrigeration industry since 1919



OVER 6,000 USERS

Save Millions

WITH

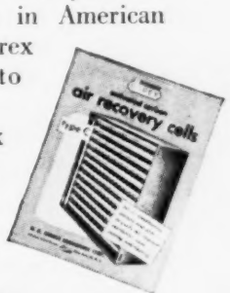
DOREX AIR RECOVERY

With Dorex C Cells in an air conditioning system, the volume of new, outside air that must be taken in can be reduced by as much as two-thirds. Thus, cost of original equipment and operating costs are both materially lower.

These facts are of great importance to economy-minded industry today.

It costs over $200 a year to condition every thousand cubic feet of new air circulated per minute. But Dorex Air Recovery "manufactures" fresh air for less than half this cost. Dorex Air Recovery is backed by more than 20 years of experience . . . the biggest names in American business are Dorex users. With Dorex Air Recovery you have more to offer your clients.

Get the complete story of Dorex Air Recovery—technical details, actual savings made, list of users. Write today for Bulletin 117-C.



"WORKS LIKE A GAS MASK"

DOREX

Air Recovery

W. B. CONNOR ENGINEERING CORP.

114 East 32nd Street, New York 16, N. Y.

Air Diffusion • Air Purification • Air Recovery

In Canada: Douglas Engineering Co., Ltd.,
190 Murray Street, Montreal 3, P. Q.

W. B. CONNOR ENGINEERING CORP.
Dept. B-50, 114 East 32nd Street, New York 16, N. Y.

Please send me, without obligation, full information on Dorex Air Recovery.

Name.....

Position.....

Company.....

Street.....

City..... **Zone**.....**State**.....

Alnor OFFERS YOU FOUR WAYS TO Save Time ...Save Money!

Time spent in needless rechecking, balancing and adjusting of heating and air conditioning systems is a waste. It can easily account for much of the cost on every installation and service job.

Here are four Alnor precision instruments that help you do a better job—faster, at lower cost. And like all Alnor instruments—in every industry—the ones shown here are favorites wherever precision and fine craftsmanship are essential.

ALNOR VELOMETER . . . is a precision-built, self-contained, portable instrument that gives instant, accurate readings of air velocities anywhere. Needs no calculations or reference charts . . . is direct reading. Available in wide scale range. Write for Bulletin No. 2448-G.

ALNOR THERMO-ANEMOMETER . . . is a compact, simple instrument for reading air velocities as low as 5 f.p.m. It makes possible fast adjustment of velocities to bring utmost comfort . . . efficiency. Drafts within rooms, flow from convectors, air flow in refrigerated spaces—all these and many more are ideal uses for this handy, direct reading precision instrument. Send for Bulletin 913.

ALNOR TYPE 2300 SURFACE PYROMETER . . . sets a new high in precision measurement of low surface temperatures. Special design from Alnico magnet to finest, quick reacting thermocouple assures unfailing accuracy . . . speed and dependability. Available in 5 Fahrenheit scale ranges with a span as small as 150°. Send for Bulletin.

ALNOR VELOMETER JR. . . . ideal for taking a quick, accurate check on circulation and diffusion of air. Sturdily built, carefully calibrated, the palm-sized Velometer Jr. gives instant reading of air velocities without timing, reference charts, etc. Send for Bulletin No. 725.

Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

420 North LaSalle Street • Chicago 10, Illinois

Illinois Testing Laboratories, Inc.
Room 514, 420 N. La Salle Street, Chicago 10, Ill.

Send complete information on the following:

☐ Velometer ☐ Thermo-Anemometer
☐ Type 2300 ☐ Velometer Jr.

Name.....

Address.....

City.....*Zone*.....*State*.....

Washington News

LORING F. OVERMAN

WEATHERWISE and otherwise, April in the Nation's capital was unpredictable.

Perhaps it all happened because those who plan the annual Cherry Blossom Festival missed the date when the pink blossoms would appear. In any event, Blossom Queen candidates shivered through a chilly and flowerless weekend. On the hunch that the following week might bring the blossoms around, the ceremonies were re-scheduled.

Out popped the blossoms as promised. Then along came stormy winds. By the following weekend, every petal had blown away.

Washington is often like that. One may not know what is going to happen, but it is a certainty that no week is going to pass by without the city on the Potomac turning up something to amuse, confuse, or confound.

Rent Control F'instance

For months now, political forecasters have been of the opinion that Congress wouldn't hold still for another year of rent control. It was thought that permission to continue controls might be granted certain areas. In general, though, it was thought that control would have to go. But trust somebody to dream up something "politically acceptable" to turn the tide.

Chairman Spence (D., Ky.), whose House Banking Committee began hearings on rent controls on April 24, proposes a new local option measure that promises to get the Congressional nod. The plan would continue rent controls through December 31, 1950, unless removal was specifically voted by local authorities or by citizens in referendum. If cities took no action, controls would die automatically at the end of this year. Controls continued by local option could not be kept in effect for more than a year.

The Spence proposal is being hailed as one of those political naturals which takes the rent control decision out of the hands of Congress in an election year, and passes the buck back to the local level. President Truman, in a special message to Congress, urged the continuation of controls for a full year. It was indicated, however, that the Spence compromise would be acceptable to him.

Tax Cut Denied

While this column cannot explain the ramifications of the State Department, it has no difficulty in appreciating the disappointment with which readers will learn that proposed excise tax cuts on commercial refrigeration and all types of air conditioning units are not likely to be granted. The House Ways and Means Committee, considering proposed excise tax cuts, voted to reduce the tax on household refrigerators and deep freeze units to 7%, but to retain the 10% tax on commercial refrigerators and air conditioning units.

Action of the committee represents another unexpected departure from patterns previously indicated. Instead of following through with a 50% reduction in excise taxes, as predicted by many, the committee decided to examine the items piecemeal. By April 21 the committee had approved reductions totalling $335 million, which is $145 million more than President Truman recommended on the items involved. Included are the following:

Present 20% tax on jewelry, furs, and most toilet preparations would be reduced to 10%. The 20% tax on women's handbags would be abolished, as would the same levy on purses, men's billfolds, wallets, and similar items. The 20% tax on luggage would remain. The 10% tax on radios, phonographs, records and accessories would remain unchanged. A 25% tax on cameras, and 15% tax on films would be reduced to 10%.

Actions of the committee are tentative. Excise questions still to be dealt with include taxes on theater admissions, passenger tickets, and communications.

Strikes Threaten

Unpredictable April came up with more than its share of strike threats—telephone, rails... and the aftermath of the coal holidays.

Senator Donnell (R., Mo.) introduced a bill to ban all railroad strikes or lockouts. The measure, which would amend the Railway Labor Act, would establish a form of compulsory arbitration and would be used after mediation and conciliation had failed.

Senator Donnell explained that his bill would make few changes in the present conciliation and mediation features of the Railway Labor Act. He said it would require a Presidential board to make a report on the merits of any dispute after mediation efforts had failed, and such report would be binding on both parties unless a Federal Court set it aside. The anti-strike and anti-lockout bans would be enforced by Federal Court injunctions.

Although it is not unlikely that continuing strikes will eventually result in restrictive legislation, there is growing evidence that prolonged striking carries with it its own reward—or punishment, depending upon point of view. Typical is the experience of the coal industry, which industry spokesmen say "is threatened with the possible loss of 40 to 50 million tons of its market this year."

Coal Loses, Oil Gains

Prospective reduction of the coal market is due to strike troubles, highly competitive conditions, and to imported oil stocks, according to George H. Love, president of the Pittsburgh Coal Company. Reporting to his stockholders, Mr. Love proposed a three-way approach to the problem. He hoped that producers could work more closely with unions; that more efficient production could result in reduced prices, and that

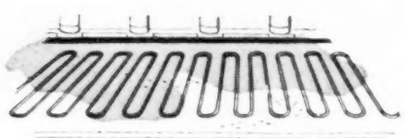
There's a Maintenance Threat in all these services...combat it with
BYERS WROUGHT IRON PIPE

If you have any of these piping services in prospect—watch out for corrosive attack! It's always a threat, and failure to use proper safeguards may mean early and costly maintenance.

Byers Wrought Iron pipe has made some outstanding records for durability in every one of these applications. We'll be glad to give you specific examples on request.

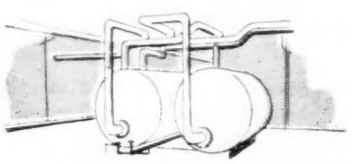
RADIANT HEATING

Wrought iron is now serving in thousands of installations, of all sizes. The superior durability of the material is demonstrated by its comparative service in skating rinks—where conditions are even more severe.



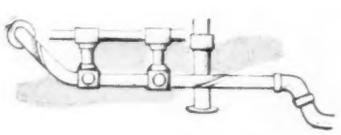
SNOW MELTING

Widely used not only because of its corrosion resistance, but because its mechanical strength protects it from crushing during installation and use.



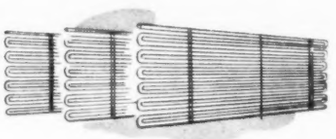
STEAM RETURN LINES

Condensate is always aggressive. Wrought iron return lines, properly installed, have proven remarkably effective in eliminating excessive repairs and replacements.



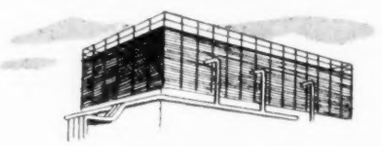
WASTE AND VENT LINES

Corrosive sewage gases quickly gnaw away any vulnerable material. Surveys of old buildings reveal wrought iron still serving after periods of up to 50 years.



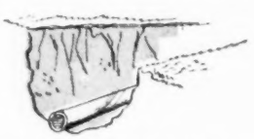
CONDENSERS

Users have reported service life of 30—40 and even 50 years from wrought iron condensers. One study of 32 condensers showed wrought iron served over twice as long as low first-cost material.



AIR CONDITIONING

Many services are highly corrosive . . . and replacements are difficult and expensive. Wrought iron has been used to safeguard operations in dozens of large installations.



UNDERGROUND LINES

Whether in trench or tunnel, corrosion is always a hazard to underground lines. Here, again, users have reported wrought iron service of over half a century.

The corrosion resistance of wrought iron comes from its unique composition and structure, which halts and disperses attack. Ask for bulletins on any services in which you are interested.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Salt Lake City, San Francisco. Export Division: New York, N. Y.

CORROSION COSTS YOU MORE THAN WROUGHT IRON

BYERS

GENUINE WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

Congress might place a protective tax on imported oil.

With coal licking its wounds, the oil heat industry is frankly jubilant over prospects. A prediction that sales of oil heating equipment will pass the 700,000 unit mark this year, and possibly exceed three quarters of a million units, was voiced in Philadelphia on April 24 at the annual meeting of the Oil-Heat Institute of America.

A. T. Atwill, president of the Institute, cited three reasons for predicting a banner year for the industry. He listed them as:

Public enthusiasm for new products and the enormous popularity of automatic oil heating; the new spirit of cooperation between the oil heating equipment industry and the oil producers, and the "approaching end of coal as a serious factor in domestic heating." The speaker said that, largely as a result of strikes and unrest within the coal industry, comparatively few new home builders are installing coal burning units. According to a recent survey by a national magazine, nine out of ten new homes will be heated with either oil or gas, he said.

Burner Shipments Up

Some verification of the Institute's predictions may be found in February figures for oil burner shipments, released by the Census Bureau, Department of Commerce. February shipments consisted of 36,814 burners and units, compared to 36,650 in January. Included in the February total were 27,230 burners valued at $2,708,000—450 more burners than were shipped in the longer month of January. Shipments also included 2,893 boiler-burner units and 6,691 furnace-burner units. All but 1,895 of February's burner shipments were of residential types.

Gas Bill Vetoed

Another April unpredictable was President Truman's veto of the Kerr Natural Gas Bill. It would have prevented the Federal Power Commission from fixing the price of natural gas delivered and sold by individual producers to pipelines for interstate transportation.

The surprising part about the veto is that Administration bigwigs were of the impression that everything had been cleared for the President's signature. Senate sponsor of the measure was Sen. Robert Kerr (D., Okla.), while House Speaker Sam Rayburn (D., Texas) and Democratic Whip Percy Priest (D., Tenn.) were chief backers of the Kerr proposal in the House. Mr. Rayburn left the Speaker's chair to make one of his rare speeches on the House floor in favor of the bill. He said, "In my opinion this bill will not raise the price of natural gas to any consumer by one red cent." Senator Connally (D. Texas), the Administration's top strategist, was particularly bitter because of the veto.

On the other hand, mayors of 18 of the country's major cities demanded that the bill be rejected as a possible cause of higher gas prices and resultant reprisals by city voters.

Thus it appears that in placating the big city gas consuming areas, President Truman may have alienated some of his powerful supporters in Congress.

Easy Housing

Possibly the President figured that the vote or two he might lose by vetoing the Kerr bill would be more than offset when he signed the "middle income" housing bill. This he did on April 20, signing into law a measure intended to make it easier for people to buy and build new single-family homes costing less than $10,000, and to promote the construction of family-size apartments, having two to four bedrooms. It is to be of little help to those desiring to build one-bedroom or efficiency apartments.

Chief contribution of the program to the prospective home buyer is that it permits low down payments and long term financing. In easing the restrictions the measure restores mortgage insurance powers of FHA.

Small Business Financing

Having taken care of housing financing, the Government wheels are now moving toward some sort of an insured loan for small business. Ostensibly, the proposal originates with the Small Business Advisory Committee of the Department of Commerce. Says an official announcement of the idea:

"Two plans for meeting the needs of small business for short and long term credit 'without Government subsidy or without cost to the Government' were recommmended to Secretary of Commerce Sawyer on April 19 by the Department's Small Business Advisory Committee.

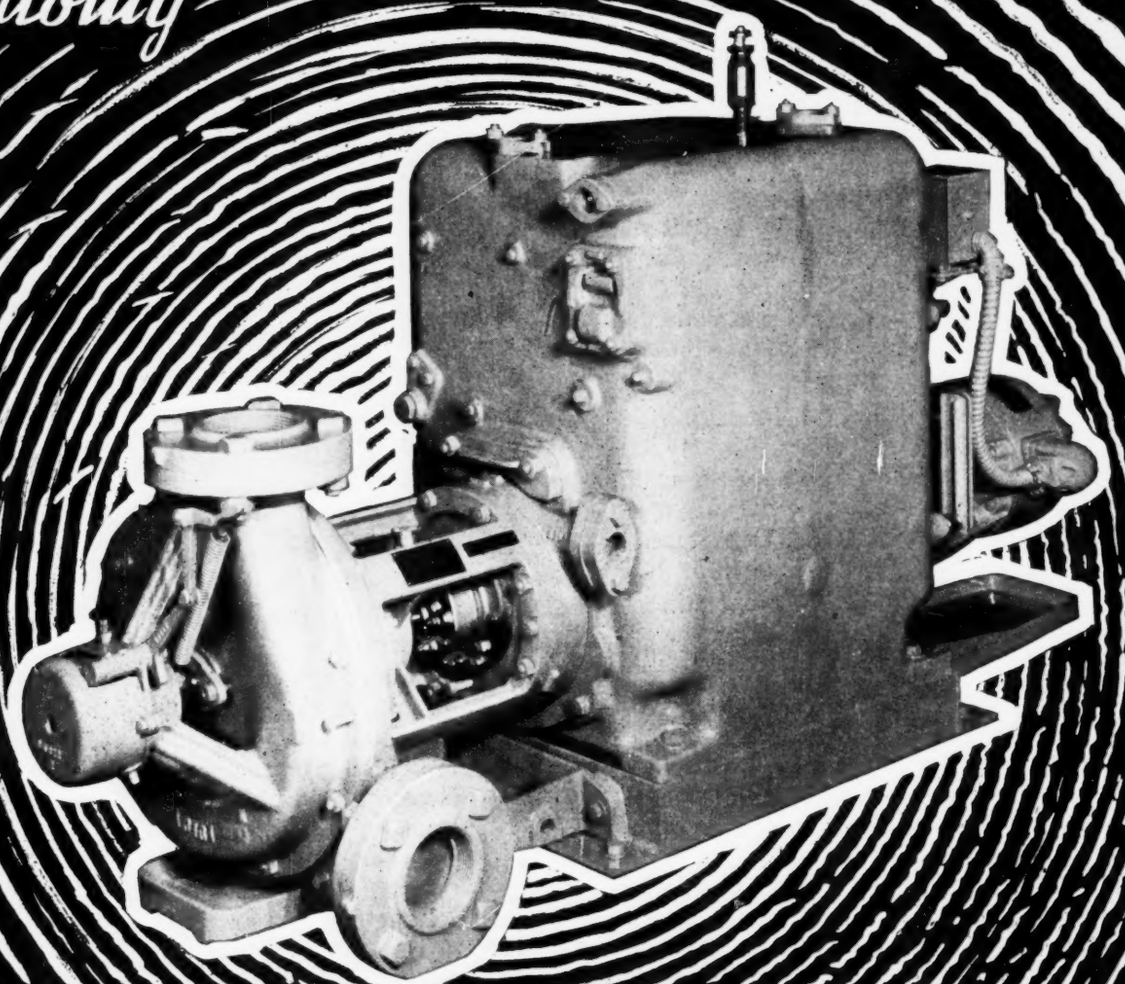
"Concluding a three-day session in Washington today, the Committee resubmitted to Secretary Sawyer its Bimson plan, named after Committee Member Walter R. Bimson, president of the Valley National Bank of Phoenix, Arizona. The plan calls for insuring loans to small business in a manner similar to the insurance of home loans under Title I of the National Housing Act.

"The committee urged that such a plan be proposed to Congress and that it provide for a loan limit of $25,000.

"The second plan urged that the Department of Commerce and the Committee 'devise means for encouraging the establishment of privately-owned and managed corporations especially chartered for the purpose of providing equity capital or loans in excess of the amounts provided under the Bimson plan. The committee said that supplying equity capital to small and newly established businesses is a highly specialized service, involving unusual risks, which called not only for sound business judgment but for management advice and counsel after the initial investment is made. Unfortunately, the committee said, very few organizations at present were qualified to offer this service. The committee therefore felt that the formation of such agencies privately-owned and managed should be encouraged."

Although the aid-to-small-business plan bears the label of a citizens' committee, there are indications that this is to be the official party line for the Administration as it prepares for fall elections. The idea appears to be to play up to small business, while at the same time investigating monopoly and questioning bigness.

Centralized Heating Economy



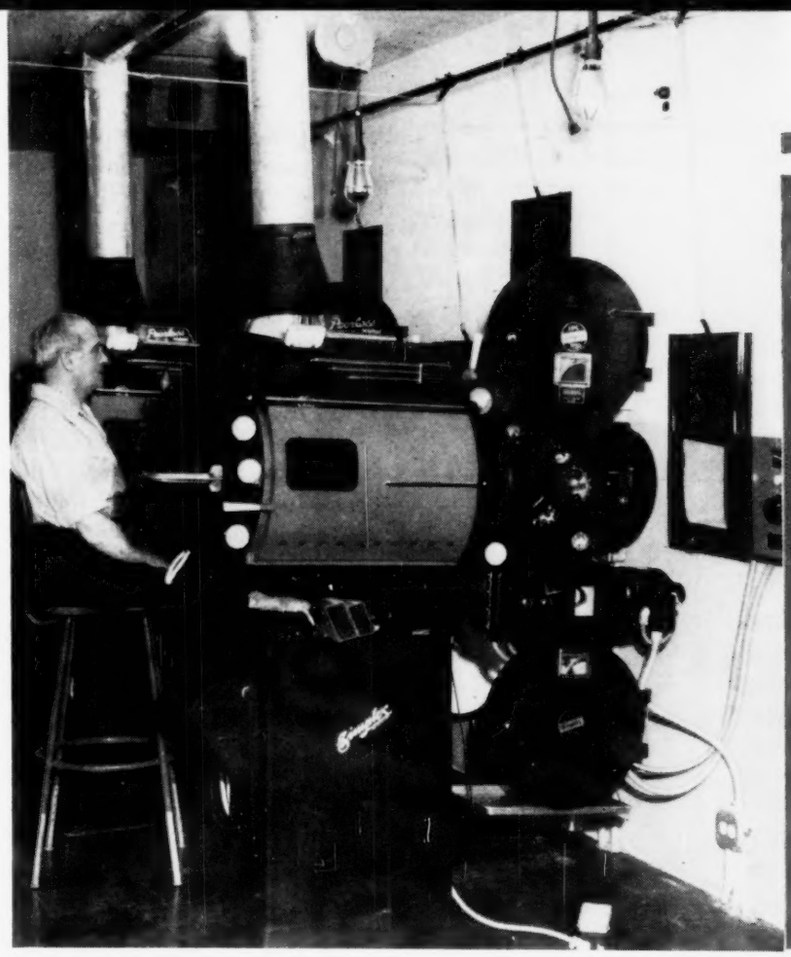
A RETURN LINE VACUUM PUMP THAT CUTS HEATING COST.

This unusual pump needs no electric current, cutting out greatest item of pump operating expense.

More important, this pump insures absolutely uniform circulation in system. That means continuous steam economy.

Simple, compact, one moving element, no wearing parts, no internal lubrication. Bulletin No. 203 gives the facts. Your copy is waiting.

THE NASH ENGINEERING COMPANY
SOUTH NORWALK, CONNECTICUT, U. S. A.



Courtesy, National Theatre Supply.

Air Conditioning and Ventilating the THEATER PROJECTION ROOM

JOHN J. SEFING
Consulting Theater Engineer, Toledo, Ohio.

Large heat concentrations and rapid heat generation from equipment create special problems in the air conditioning and ventilation of projection rooms in motion picture theaters. Because of the fire and life hazard to theater occupants, special design requirements are recommended which are described in this article.

NOTWITHSTANDING steady and important improvement of theater projection equipment, operating technique and construction methods, there still is considerable confusion and groping in the dark concerning the proper air conditioning and ventilating of projection rooms. As a general rule, weeks and sometimes months are spent in careful and exact computations of the proper air volumes, velocities, effective temperature, resistance pressure, and duct sizes for the theater auditorium ventilating and air conditioning systems. Then when it comes to the projection room, a duct tap is made from the auditorium in the most convenient place and the ventilating job is left for some subcontractor to finish in the best way possible.

It must be remembered that in the theater field, the projection room is considered "the heart of the theater" and as a result should always be accorded special attention. It must be recognized that present-day projectors, current rectification apparatus and arc lamps are precision-made pieces of equipment and, as such, require special consideration if full operating efficiency is to be expected. The human element is also important. Most theaters have two projectionists in the projection room to operate the equipment. If they work in a poorly ventilated room for several hours, their work and health will be affected by poor ventilation. Therefore, the first thing that should be considered for satisfactory operation is provision for an efficient exhaust system to dissipate the rapid accumulation of hot, vitiated air in the projection room.

Units that generate continuous heat while in operation are the motor-generator sets, or rectifiers, if used, the ballast rheostats, and especially the arc lamps in the projectors, spotlights and effect machines. As a point of information, a 70 to 140-ampere motor-generator set gives off air heated to about 90F when operating at full load. There are usually two such sets in the projection room. A 70-ampere metallic-type rectifier, and there are at least two such rectifiers in the projection room, dissipates air heated to about 100F at full load.

The motor-generator sets or the rectifiers supply d-c power at the proper voltage to the arc lamps. The ballast rheostats are used only when motor-generator sets are installed or when the d-c electrical supply is taken directly off the electric utility's outside lines. Accordingly, a ballast rheostat is installed for each arc lamp supplied. The heated air given off is about 150F, depending, of course, on the amount of electrical current to be dissipated in the resistors. The critical problem is the proper ventilation of the arc lamp which, beside having an arc spot reflection of about 1,300F

TABLE 1—SPECIFICATIONS FOR AVERAGE TYPE PROJECTION ARC LAMPS

Direct Current		Lip Diameter on Top of Lamphouse[1], Inches	Height From Lip to Floor, Inches	Projection Room Wall to Center of Lip[2], Inches	Av. Lamp Exhaust, Cfm	Av. Velocity, Fpm
Volts	Amperes		6 Deg Projection Angle[3]			
27	40	5¼ × 6¼ (oval)	61	48	75	550
40	75	8	65	51	100	600
69	180	9	68	41	150	650

[1]Lip on top of lamphouse for connecting to the duct tap from the arc exhaust duct system at the ceiling.
[2]Distance from the inside face of the projection room front wall to the center of arc lamp duct lip.
[3]Angle tilted downward toward center of screen; varies with each theater.

at 90 amperes, gives off constantly, while in operation, hot carbon gas, ash and fine particles of copper drippings. When operating at this electrical load the temperature on the inside of the arc lamp is around 300F directly over the arc and near the exhaust stack.

In the average theater there are two projector arc lamps and one spotlight or one effect arc lamp. However, in the larger theaters having stage acts, in addition to motion pictures, there may be three projector arcs, two spot arcs and a double effect arc. This calls for the installation of larger motor-generators and ballast rheostats which results in a larger amount of heat that is given off in the projection room. From this it can be readily seen that each projection room will have its own special problems due to the variation of the type and size of the equipment (50 to 140-ampere), the number of units installed and the physical layout of the room. However, when designing the ventilating system for the projection room, the same care should be taken as is employed in laying out the auditorium system.

In designing the ventilation for the projection room, two separate systems should be laid out, not one common duct system to serve the various rooms and the heat-generating arc equipment. One separate duct system should be always designed for the arc lamp exhausts. The ductwork, properly sized and without sharp bends, should supply the correct volume and velocity of air so that while it will not disturb the sensitive arc flame, it will still carry away the carbon ash, gas and copper drippings. The other system should carry away the accumulated hot air from the various rooms and especially from the bank of ballast rheostats, and auditorium lighting dimmer resistors, if installed in the projection room.

Arc Lamp Exhaust System

In the design of the arc lamp exhaust system, the velocity of the air through the ducts should be determined rather accurately. When the velocity is around 2,000 fpm, the air will create a swishing, whistling noise as it passes by the arc lamp dampers, air intake louvers, or grilles. While this high pitch noise will be very troublesome to the projectionist, the most important fact is the definite effect it will have on the stability of the arc flame. Since the volume of air in the exhaust system is very important to carry off the heat, gas, and ash from the arc lamps, the resistance pressure of the ductwork must be kept down to the absolute minimum. The noise that will come from the exhaust fan or blower must also be watched in order to have a quiet, efficient arc lamp exhaust system.

Accordingly, the tip speed of the fan or blower must be kept down as this tip speed will determine the amount of noise in the system. For the average size theater projection room, having relatively a short run of ductwork, the tip speed of the exhaust fan or blower should be about 900 fpm. From experience, it has been noticed that tip speeds over 900 fpm will introduce objectionable noises in the exhaust system. When the arc exhaust system is designed and installed improperly, many complications will arise that will be a source of continuous trouble. The cost of a first-class efficient arc lamp exhaust system, and of a separate exhaust system for the projection room, will more than pay for itself.

At the present time, there are not many theaters that have an honest-to-goodness air conditioning system in the projection room. By the same token, only theaters that have been constructed in the past few years have passable ventilating and exhaust systems. Now, this might be because of the initial cost and the large amount of money spent for projection equipment, or it might be that the design engineers and architects, and even the theater owners, are not quite familiar with the special requirements.

Operating Troubles

Many times, in the past, some theaters would complain that the projected light on the screen fades in and out and, even after an electrical checkup, the trouble could not be remedied. However, upon a thorough investigation of the equipment, in most cases, it would be found that the cause of the trouble was simply too much draft in the arc lamphouse.

It must be remembered that the latest Suprex 35-volt carbon arc is especially sensitive; a strong suction of air will cause the arc flame to flutter and even sometimes to "put out" the arc flame entirely. Now, to try to overcome this fault, the damper in the exhaust duct opening is reduced by the projectionist. If the velocity of the air is too great, this damper must be nearly closed to steady the arc flame. However, closing the damper will practically eliminate the exhaust from the arc lamphouse and, as a result, the inside of the lamphouse will become littered with carbon ash, and reflector pitting will be increased. Also, with the damper nearly closed and with the air moving at a high velocity, a disturbing whistling noise will result.

In most cases, this particular trouble will be found in theaters that have the arc lamp exhaust system connected with a one-main duct system and one large exhaust blower. A one-blower exhaust system, ventilating all the projection room areas requires that both air volume and velocity must be quite high to ventilate rapidly these areas.

In other cases, just the reverse will be found; the exhaust blower is just barely large enough to ventilate the room areas so that there is hardly any exhaust at the arc lamps. Now, when the arc exhaust system is too small, the ducts will become closed-up with carbon ash and dust in a relatively short time. The inside of the arc lamphouse, together with the reflector, will be constantly covered with the carbon residue. From this it is evident that the design and installation of the projection room exhaust system can not be just approximated. Serious consideration must be given to physical conditions, and to the type of projection equipment to be ventilated.

Exhaust blowers must have sufficient capacity. Ducts must be of the proper size and shape, devoid of tricky bends which would restrict the flow of air and act as traps for the carbon ash and dust. While it seems impossible that a 6-inch diameter duct could ever become almost entirely choked up with carbon residue, in several cases where the exhaust system was under-capacity and had improper duct layout, a hole only about 2 inches diameter was found when the duct was dismantled.

Lamp Characteristics

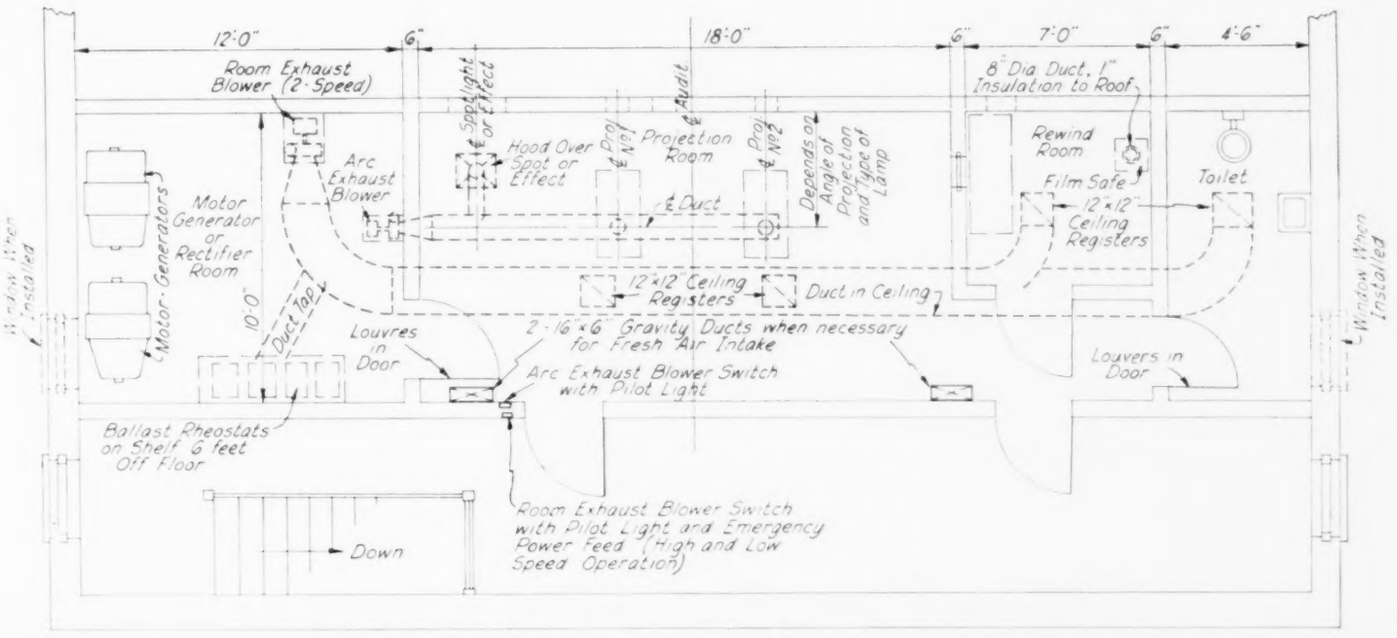
In laying out an arc lamp exhaust system that will be efficient and trouble-free in the projection room, it is important to know the particular type and size of arc lamp to be installed. To give an idea of the variations that will be encountered in the layout work, the operating characteristics of three widely used projection arc lamps are given in Table 1. Of course, there are other types and sizes of arc lamps on the market, but the ones under discussion will give a fair indication of what is used in the average size theaters. Spotlight arc lamps operate from 32 volts, 46 amperes, to 55 volts, 80 amperes. The effect machine arc lamps operate from 32 volts, 45 amperes, to 40 volts, 70 amperes. Knowing the exact location of the exhaust lip on top of the arc lamp, and the angle of projection, it is then possible to locate the exhaust duct system at the ceiling accurately and directly over the center line of this arc lamp exhaust lip. In this way there will be no need for several sharp bends and tricky connections from the ductwork at the ceiling to the lip on top of the arc lamp.

The angle of projection will vary anywhere from 4 to 20 deg and, as a result, the distance from the front wall of the projection room to the center of the lip on top of the arc lamp, as well as the distance from the floor to the top of this exhaust lip, will increase as the angle of projection increases. In other words, as the projection machine is tilted downward, its base must be shifted away from the front wall, and the arc lamphouse top becomes higher from the floor.

For proper arc lamp exhaust of the types of arc lamps under discussion, the air capacities listed in Table 1 are recommended.

As a basic point of information, the average two-arc projector and one-arc spotlight or effect machine installation has an exhaust blower of around 400 cfm capacity at ¼-inch resistance pressure, with a ⅛ hp, single speed motor. It is controlled with a two-pole, single-throw toggle switch having an indicating "bull's eye" light to show if the blower is off or on. The switch should be located inside of the projection room, convenient for the projectionist.

After the main duct system has been laid out along the ceiling and run in line directly over the center lines of the arc lamps, or as closely to it as possible, separate duct taps must be installed downward for connection to the arc lamps. In the duct tap that comes down to each arc lamphouse, a reasonably tight-fitting damper should be installed for positive control of the air flow. On some types of arc lamps, a damper is already installed, but from experience it has been found that, at best, it is ill-fitting and affords hardly any control over the air movement within the lamp. This duct tap should terminate at least 18 inches from the top of the exhaust stack on the arc lamp, and either a flexible



Plan of a typical projection room showing room and arc exhaust duct system.

duct connection or a tight-fitting but free-sliding sleeve should be installed, fastened with Parker screws to the lip of the exhaust stack. The duct section that is fastened to this lip should be cut with shears to fit properly the angle of the projector arc lamp. In most cases, the duct tap comes down straight from the ceiling ductwork, while the arc lamphouse is at an angle to it, due to the angle of projection. In this way, the duct tap will fit snugly the top of the lamphouse and still be flexible enough for any movement of the arc lamp in future adjustments, servicing or replacement.

Dampers

In laying out the duct tap or taps for the exhaust of a spotlight or effect machine arc lamp, the type and size of these particular arc lamps should be known beforehand in order to determine exactly the run of the ductwork and its proper termination. However, the duct tap that goes over to the spotlight arc lamp should have at the end a metal hood at least 20 inches square, directly over and at the center of the spotlight. Normally, the hood is about 72 inches off the floor with a damper inside for controlling the air exhaust. The hood is provided because a spotlight arc lamp cannot be directly connected to a duct system for, when in operation, it must be moved to and fro, and up and down, as it follows the performers on the stage.

The damper is placed in the duct tap to shut off the air flow when the spotlight is not in operation; otherwise, the air exhaust of the projector arc lamps will be affected. In other words, with this damper opened or with no damper in the duct tap, most of the air exhaust will be by-passed through the spotlight exhaust duct and less air will be pulled from the projector arc lamphouses.

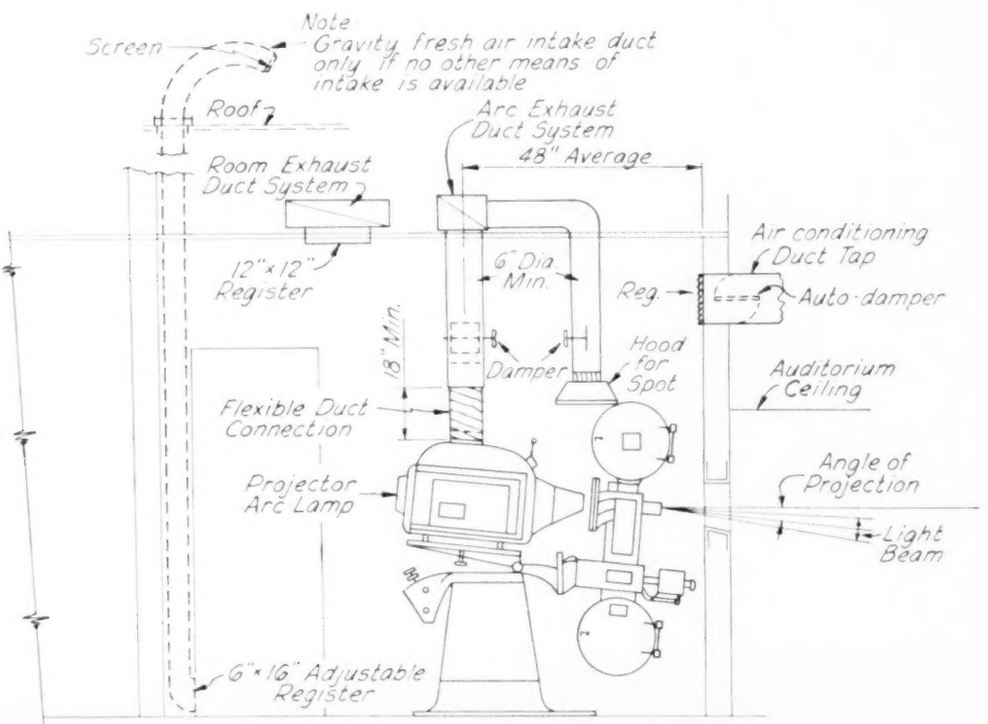
Specifications for Taps

When sizing the main duct into which tap the projector and spotlight or effect machine arc exhaust ducts, the tap should be made at least 80 sq in. in cross-sectional area. However, some city or state codes call for this duct to have a minimum area of 79 sq in., and the flow of air through it at least 50 cfm when the arc lamps are in operation. As is evident from this discussion, this minimum is far less than what the latest arc lamps require for proper ventilation and for carrying off of the carbon residue. Local authorities having jurisdiction should be consulted in every case, to make sure that their minimum requirements, if any, are met with and so that there will not be any violations later on.

The discharge duct from the arc lamp exhaust blower should be at least 100 sq in. in cross-sectional area, with no sharp bends or elbows and with a goose-neck connection ending a minimum of 30 inches above the roof level. This goose-neck connection works out well, since it offers less resistance to the flow of air and passage of the carbon residue than the ordinary dome-shaped weatherhood. At the end of this goose-neck is installed a ½-in. mesh copper screen to keep out foreign bodies or materials. In no case, should the arc exhaust system be designed or installed with the ducts from the arc lamps tapped into one large duct or individual ducts going through the roof, all depending on gravity exhaust. With such a poor arrangement, there will be hardly any pull from the arc lamps. With a strong wind blowing toward the discharge end of the ducts, the carbon ash will be blown back into the arc lamphouses, scattering dirt and creating a definite health hazard for the projectionists.

Projection Room Exhaust

For the general exhaust system of the projection room proper, motor-generator or rectifier room, and the rewind and toilet rooms, a properly designed duct system should be installed with a two-speed blower. This room exhaust blower should handle at least 2,000 cfm of air at the high speed and about 1,000 cfm at the



Side elevation showing arc lamp exhaust connections.

low speed. The low speed is for normal everyday operation and the high speed in case an emergency develops within the projection room.

For high speed emergency use, the blower should be installed so that it will be turned on by a switch connected to the fire shutter trip mechanism. With this arrangement, in case of a fire within the projection room, the tripping of the fire shutters over the port openings will automatically turn on the exhaust blower at high speed, thus exhausting rapidly the smoke or gas from the room. For low speed, normal operation, the blower should have a manual control switch, two-pole toggle type with indicating pilot light, to show when the blower is on or off. This switch should be located outside the projection room proper, preferably near the entrance door, so that it will not be necessary to enter the projection room, in case of a fire, to turn on the blower or to see if it is operating. It must be kept in mind that a film fire starts very quickly, generates terrific heat, and gives off a deadly, poisonous gas. It is suicide to try to fight the fire or linger around looking for the switches that control the exhaust blower.

Another important thing is for this exhaust blower to be connected to the emergency electric power system so that in the event of any failure of the general lighting panel in the projection room, the blower would still be operative. As can be noted, very special care must be taken in designing and installing the projection room exhaust system.

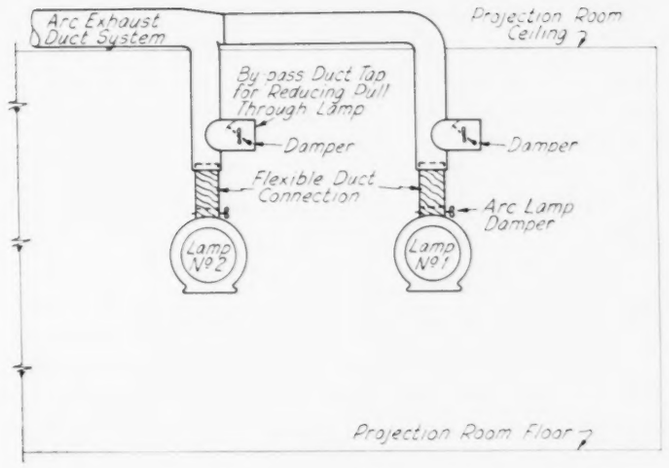
Some local codes require that the projection room have a minimum 10-minute air change but actually it should be nearer 4 minutes in order to carry off the heat generated by the latest equipment, and especially to remove smoke and gas in the event of a film fire.

Fresh Air Intakes

In order to achieve an efficient ventilating system in the projection room, there must be some means for introducing fresh air. There are three possible ways of getting fresh air into the room. The simplest way, if there are windows in the room, is to open the windows and depend on the proper amount of air to flow inside.

Another method is to install gravity fresh air intake ducts from the roof down into the projection room. Where only this means of supplying fresh air is possible or practicable, at least two 6 by 16-inch gravity fresh air intake ducts should be installed. These ducts should run from a goose-neck connection on the roof straight down to the floor of the projection room with an adjustable register in each duct at the floor. However, the ducts should be spaced so that the fresh air enters in the most advantageous location in order to have reasonable cross-ventilation to the various rooms.

The third method, and the best of the three, is to have several duct taps into the general air conditioning duct system, supplying the theater auditorium, for positive fresh air intake. However, there are many precautions that must be taken before this can be done efficiently and successfully. Extreme care must be exercised that these duct taps are located properly and not in such a way that a cold blast of air will hit the projectionists, who must either sit or stand around the



Rear view of lamps to show exhaust duct taps with by-pass connections for reducing excessive air pull on arc flame.

projection machine for hours. It is also important not to have a direct stream of cold air strike the hot sides of the arc lamphouse, projector mechanism, and especially the lens. It must be remembered that the projectors have precision-made parts and any extreme variations of temperature will affect their efficient operation, and can help develop fractures in the lens system.

Taps to Air Conditioning Ducts

The best locations for these air conditioning duct taps is about 6 ft off the floor on the front wall of the projection room, but at least 5 ft to either side of the center line of the projector machines. Another good location is to have the duct taps at the ceiling about 6 ft from the front wall of the projection room. However, when in this location, care must be taken that the duct outlets are not near the exhaust grilles of the general room exhaust, otherwise the conditioned air will be by-passed.

Whenever duct taps are taken off the air conditioning system in the auditorium, for supplying conditioned air to the projection room, the ends of these ducts must have automatic shutters or dampers that will close by the tripping of the fire-shutters or gravity in case of a film fire. This precaution must be taken so that the smoke and gas from a film fire will not back up into the auditorium through the duct system.

The heat gain load per hour for the different heat-producing units installed in the projection rooms has not been compiled completely. These different types of arc lamps vary considerably in operating characteristics, and the physical layouts of the projection rooms are not consistently the same as to size, insulation, and exposure. Therefore, each new installation presents its own specific problems. For example, one type of arc lamp depends entirely on forced circulation of air for cooling, while another type has a water-cooled jacket to help dissipate the heat.

The main idea in ventilating and air conditioning projection rooms is to have a constant and reasonable amount of pure fresh air as a safeguard that the arc lamp heat and gas do not vitiate the air in the various rooms. As long as there is an ample and steady movement of air, this air motion will make any moderate

condition within the projection room feel cooler. From personal observations in first-class, air conditioned projection rooms, the optimum effective temperatures should be from 66 to 75F summer and winter, with relative humidity between 40 to 60%. The maximum air velocity should be 400 fpm but preferably 300 fpm from the standpoint of health and comfort of the projectionists.

Ductwork

In designing the size of the projection room general exhaust ductwork, the smallest size duct should be the farthest from the blower, and the ductwork gradually increased in size toward the blower. A ceiling register of about 12 by 12 inches should be installed in the toilet room and the film rewind room; at least two registers in the projection room proper; and at least one in the motor-generator or rectifier room.

When metallic element rectifiers are installed instead of motor-generator sets, a duct tap with hood should be placed directly over this equipment in order to have positive exhaust of the large amount of heat given off. This should apply equally as well where a large bank of ballast rheostats are installed.

Self-closing louvers should be installed at the bottom of the motor-generator or rectifier room door for free circulation of the air. A similar louver should be installed in the toilet room door. At the discharge end of this general room exhaust blower, the ductwork should run to the roof as straight as possible, be free from any sharp bends or elbows, and terminate in a goose-neck connection. In case a film safe is used in the film rewind room for the storage of film, at least an 8-inch diameter duct, with one-inch asbestos insulation installed around up to the roof line, should be run from the top of this film safe to the outside on the roof, terminating in a goose-neck or weather-proofed dome-shaped hood. Most codes require that a fusible damper be installed either at the inside top of this film safe or in the duct. This special damper is of the type that opens automatically when the fuse trigger melts at a certain temperature. When the film safe comes to the job without this damper, one must be installed.

Building Advances Require New Review of Codes

The status of present building codes requires careful consideration in view of the disparity in age, type and scope of regulations, and various local factors. Any analysis that is to escape over-simplification must consider not only the fact that most codes are, in varying ways, out-of-date but that nearly one-third of the municipalities lack proper regulations while some codes are not rigorous enough, raising the question of the public safety. Revision of old codes is complicated by at least two factors.

(1) Testing and evaluation problems involved in the appraisal of new materials. Developments for revision of codes are many and complex and exceed the facilities of municipalities.

(2) Diversity of geographic and climatic conditions necessarily requires variations in the detailed regulations of codes. However, greater uniformity in codes is feasible, and such uniformity would achieve economies in construction and simplify the problems of designers, builders, and manufacturers.

This information was revealed in a study conducted by the National Bureau of Standards.

The statement is frequently made that existing building codes tend to become out-of-date through failure to keep abreast of engineering developments. The fact that over 200 municipalities are actively engaged in complete revision of their codes indicates the growing appreciation of the benefits to be derived from modern codes.

Any appraisal of the effect of building codes on present rates of construction must take into account several factors, each complex. Building costs without question represent the most important limitation on rate of construction. Codes affect costs and thus construction where they unduly restrict the utilization of more economical materials, methods, and design. There have been advances in science and engineering which, it is claimed, are not now adequately reflected in many building codes, and here modernization of codes is important. But the influence of codes on rate of construction is secondary to that of the cost of materials and labor.

Delays in code revision are partly due to lack of standard methods of testing and of evaluating new developments in materials, methods, and design. Local authorities engaged in building code revision have a number of sources of information to which they can turn: Organizations of building officials, fire underwriters' associations, and standardization bodies—as well as the National Bureau of Standards and other Government agencies. The dissemination of technical information by such organizations represents an important element contributing to the application of new developments in the construction field and to the maintenance of proper safety measures for the protection of life and property.

Thus, the National Bureau of Standards has placed its findings at the disposal not only of Federal agencies but also state and local governments, which are primarily concerned with building regulations. The investigations of the Bureau, extending over a period of nearly 50 years, cover the entire field of building technology, ranging from small dwelling units to large structures like skyscrapers. Data relating to properties of materials, whether acquired as a part of the building technology program or in the other programs of the Bureau, are compiled and integrated for this purpose. The importance of such synthesis stems from the fact that thousands of materials and products are utilized in construction.

Methods of Supporting Pipe

J. E. YORK
Building Service Engineer, Stone & Webster Engineering Corp.

The first of a group of articles that will describe and illustrate the various means for supporting pipe.

IN order to obtain a satisfactory piping system, it is important that careful consideration be given to the proper method of supporting piping, valves, fittings and accessories.

Many factors must be carefully examined before the most suitable hangers and supports can be selected for a specific piping system, although, generally, low initial cost receives first consideration. Some of the points that must be studied are:

(1) Class of construction of the building in which the supports are to be installed.
(2) Service for which the piping system is to be used.
(3) Location of the pipes in relation to each other, equipment, and suitable points of support in the building, or out of doors.
(4) Structure to which the pipe hanger or supports must be attached.
(5) Importance of proper initial grading and later adjustment to offset the effects of any settlement of the structure.
(6) Effect of temperature changes and the stresses that may be caused thereby.
(7) Safety of the installation.
(8) Simplicity of assembly and ease of installation.
(9) Relative importance of neatness of appearance.

Buildings with Wood Beams and Floors

Water, gas or other pipes normally installed in the basements of low cost housing or in other buildings with wood beams, or in areas where (1) appearance is not too important and (2) where there is no movement due to temperature changes, may be supported from the beams by wire pipe hooks. The support is made of special hard drawn wire of extra heavy gage.

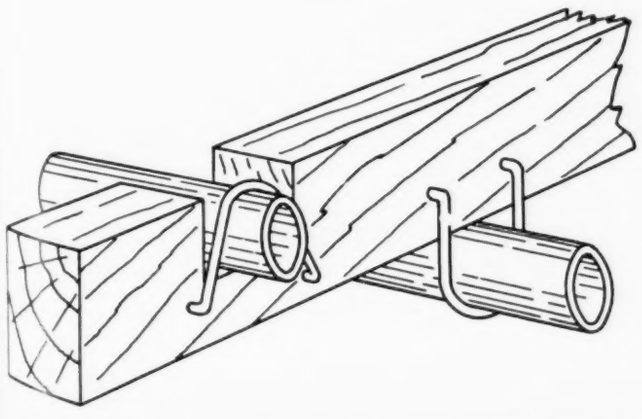


Fig. 1. Wire pipe hooks that are driven into wood beams.

The driving head is bent to make it easy to drive and the ends are cut to sharp nail points for penetrating either soft or hard wood without bending. The hangers can be obtained with copper finish as protection against corrosion. This type of hanger, Fig. 1, is made in sizes suitable for use with from ½ to 2-inch pipe and can be used in various positions. Since it does not require the use of nails or screws, the installation is simplified.

No adjustment is possible with this type hanger. It should be used only for very low price installations where such grading of the piping as may be necessary, can be done before installation of the hangers.

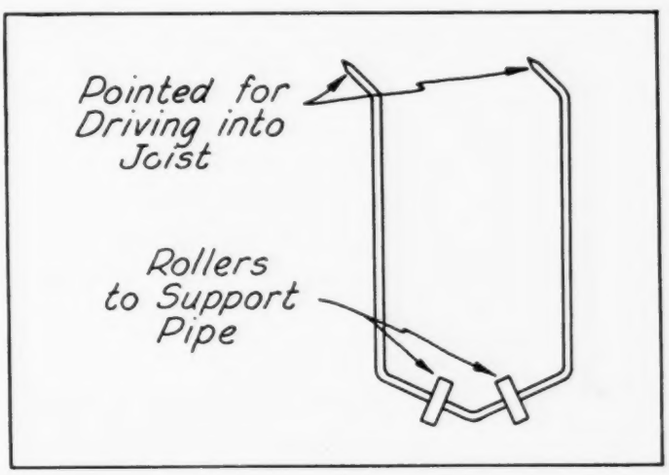


Fig. 2. Wire pipe hanger provided with rollers on which the pipe rests.

Fig. 2 shows a form of wire pipe hanger for driving into wood joists that has two rollers on which the pipe rests. A copper-clad wire hanger serves as the axle for the brass rollers. These hangers, which are designed to eliminate noise from creeping pipes in radiator heating installations, come in lengths of 4, 6 and 8 inches and for ½ to 1¼-inch diameter pipe.

Another support for driving into wood joists, Fig. 3, is used for supporting tubes tightly against the un-

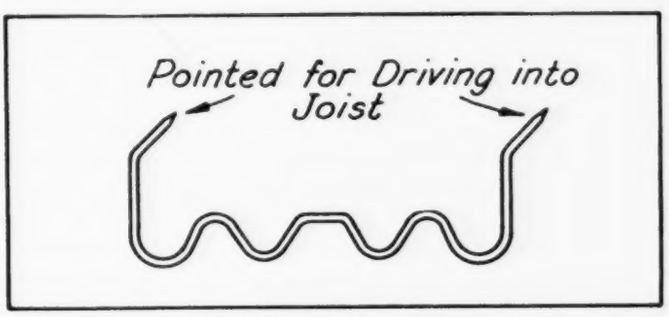


Fig. 3. Support for holding a number of tubes against the underside of a joist.

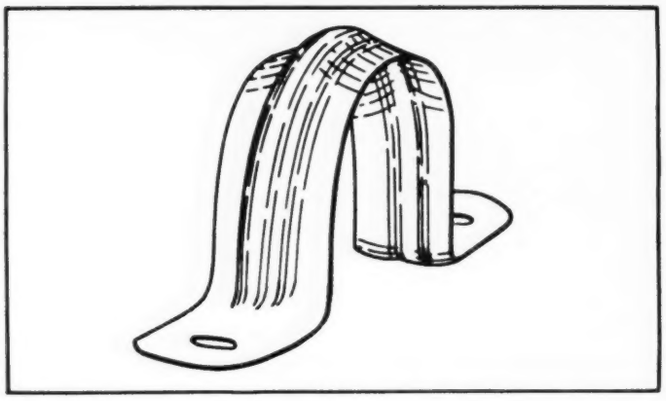


Fig. 4. Galvanized pipe clip.

derside of the joists. It enables accurate spacing of rows of tubes as in radiant heating systems. The hangers can accommodate various sizes of tubes on 4-inch and 6-inch centers.

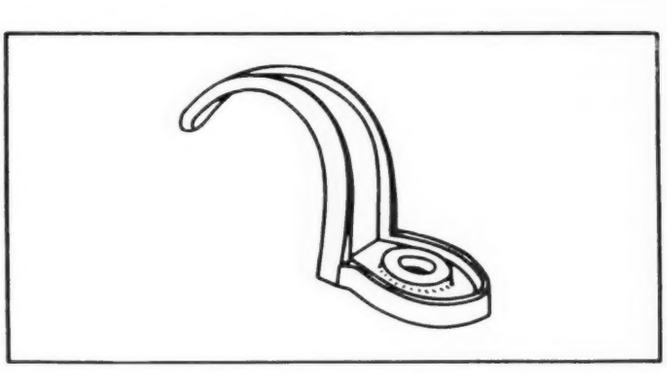


Fig. 5. One-hole pipe clamp.

When pipe lines which are not subject to temperature changes are run close to the underside of the floor beams, galvanized pipe clips, Fig. 4, or malleable one-hole pipe clamps, Fig. 5, may be used. The galvanized pipe clips are available for pipe sizes $\frac{3}{8}$ to 2 inches, inclusive, and the one-hole pipe clamp for sizes from $\frac{1}{2}$ to 4 inches, inclusive.

For supporting cast iron soil or waste piping which runs along a masonry wall, soil pipe drive hooks, Fig. 6, may be used. The band is made of $\frac{5}{8}$ by 3/16 inch steel and the toe of $\frac{3}{4}$ by $\frac{1}{4}$ inch steel welded together

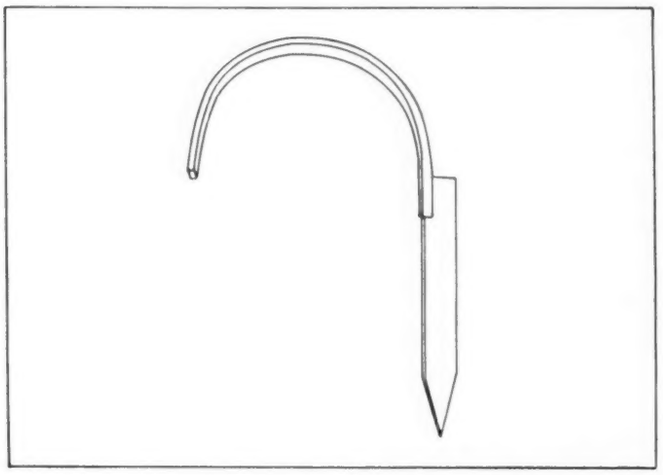


Fig. 6. Soil pipe drive hook.

in such a manner that the end of the toe can be struck with a hammer. The toe is pointed like a wedge so that it can be driven between the courses of masonry. Hooks of this type can be furnished either straight or twisted for use in either the vertical or horizontal courses of masonry.

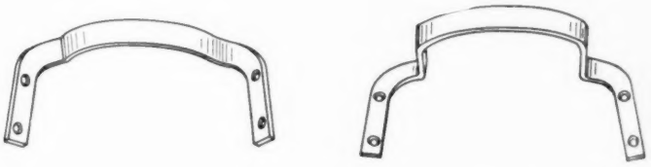


Fig. 7 (left). Soil pipe corner clamp. Fig. 8 (right). Soil pipe flat clamp for use against a flat wall.

Two forms of soil pipe clamps for supporting vent and soil stacks in residences or small industrial buildings of wood construction are shown in Fig. 7 and 8. The soil pipe corner clamp shown in Fig. 7 is used only where the stack runs up in a corner, and the soil pipe flat clamp, Fig. 8, is used when the stack is located against a flat wall. The clamps are placed on the pipe under the hub and are secured to the wall by screws or nails.

Fig. 9 illustrates the hanger that is sometimes used for supporting steam lines from 1 to 2 inches diameter on low price installation. It is made from $\frac{3}{8}$-inch rod in lengths from 6 to 16 inches and has the end flattened and punched for screws.

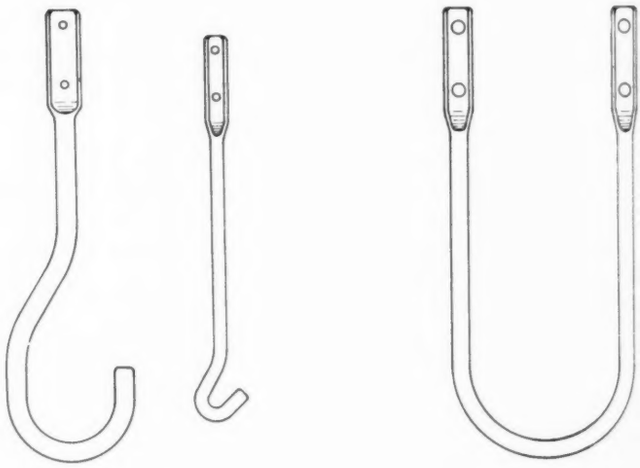


Fig. 9 (left). Steam pipe hanger for small diameter pipe Fig. 10 (right). Round U-hanger for larger size pipe.

The round U-hanger, Fig. 10, is of similar construction and is manufactured in lengths from 6 to 2 inches for pipes from 2 to 6 inches in diameter. This hanger must be installed after the pipe has been erected on temporary supports and has been properly graded. Piping supported by the hangers in Fig. can be taken down or replaced, if necessary, without taking down the hangers. However, the method shown in Fig. 10 provides greater security against piping coming off the hangers because of movement due to expansion or contraction, or of being knocked off.

Hangers shown in Fig. 9 and Fig. 10 may be attached to the building timbers with either nails, driv

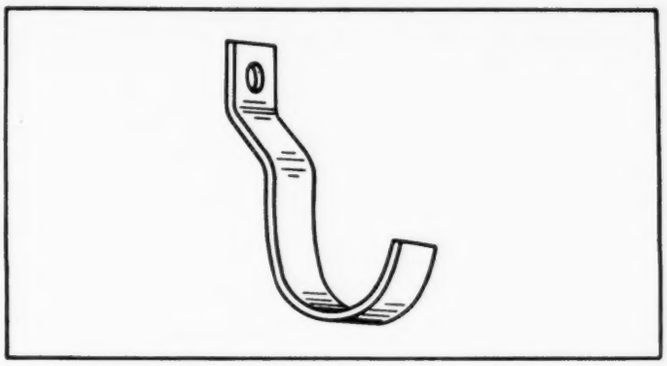


Fig. 11. Flat offset hook.

screws, regular wood screws or coach screws. Drive screws may be driven with a hammer like nails, but have greater holding power and can be withdrawn with an ordinary screwdriver.

For installation of return lines close to but not tight against partitions or outside walls, the flat offset hooks illustrated in Fig. 11 may be used for pipe sizes from ½ to 3 inches, inclusive.

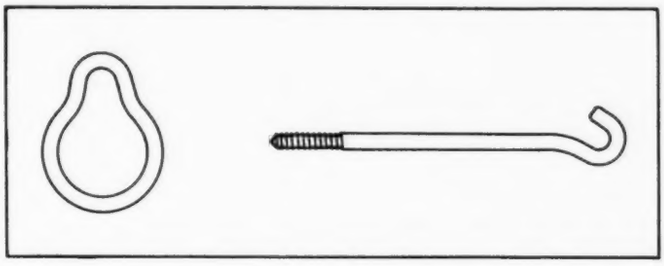


Fig. 12. Lag screw hook with malleable pipe ring.

Lag screw hooks with malleable pipe rings, Fig. 12, are commonly used with wood construction for ordinary pipe lines from ¾ to 8 inches in diameter when there is no vibration and when low cost is essential. The lag screw thread should be cut, not rolled, and should have a wood screw point which does not require that a hole be bored into the timber before screwing the hook into position. This type of hanger is not recommended by the Underwriters for use with sprinkler systems.

Hangers in Moderate Cost Buildings

Piping systems in moderate cost commercial buildings and residences will generally consist of heating, plumbing, and gas lines. In addition, commercial buildings may have sprinkler systems.

Steam and return lines should be pitched for removal of condensate during operation; drain lines should be pitched to provide adequate flow under normal conditions; and domestic water and fire protection lines should be pitched to permit drainage when shut down.

Some method of adjusting the length of the pipe hangers is therefore necessary to permit proper grading of these lines after installation. Several types of adjustable hangers are available, some of which are described and illustrated.

The three-piece adjustable clip ring hanger, Fig. 13, is made of malleable iron and consists of an adjustable clip base, adjustable clip ring, and a hanger rod. This type of hanger is for use on ¾ to 2-inch pipe, and allows about 1½ inches adjustment which can be made easily after the pipe is installed. The adjustment is secured by raising the pipe until the head of the rod is close to the ceiling, and turning the rod.

The ring, which is solid, must be slipped over the end of the pipe as it is erected.

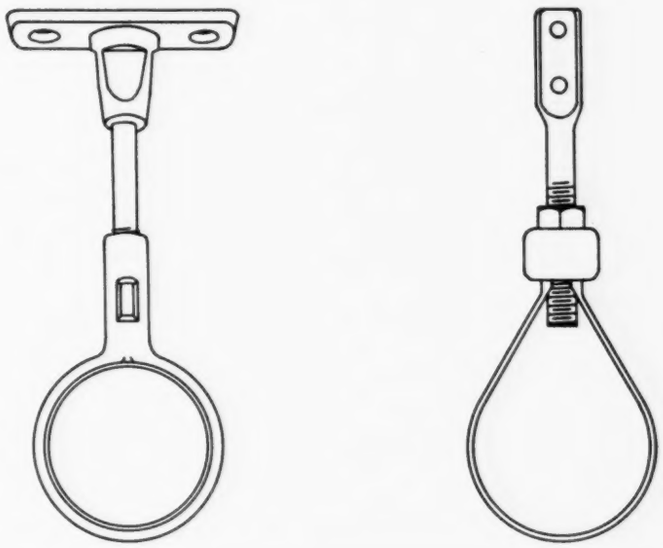


Fig. 13 (left). Adjustable clip ring hanger. Fig. 14 (right). Steel band hanger with adjusting nut.

The steel band hanger with malleable adjusting nut, Fig. 14, is light in weight, and is easy to install and to adjust after installation. The top of the malleable nut is tapped for the hanger rod and the lower ball section is grooved inside to receive the formed ends of the galvanized ring. Before the nut is screwed up on the rod, the band ring may be sprung together for removal from the nut and spread to go over the pipe. The ends of the band may then be inserted in the nut and the nut screwed up on the rod which forms a spreader, thus positively preventing any further separation of the nut and the band. The upper end of the rod may be flattened, as shown, for attaching to the side of a wood beam or threaded for use with a side beam connector, as illustrated in Fig. 15, or to a ceiling flange, as shown in Fig. 16. This type hanger can be obtained for pipe sizes from ½ to 8-inch.

Solid and split ring swivel type hangers are shown in Fig. 17 and 18. The swivel nut may be tapped for

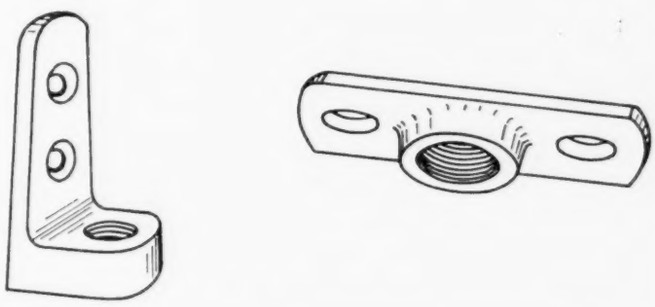


Fig. 15 (left). Side beam connector. Fig. 16 (right). Ceiling flange.

either pipe or bolt thread and by turning the swivel on the rod or pipe, the pipe may be raised or lowered to the desired level. After the proper adjustments have been made, the locknut on top may be tightened to prevent loosening under vibration.

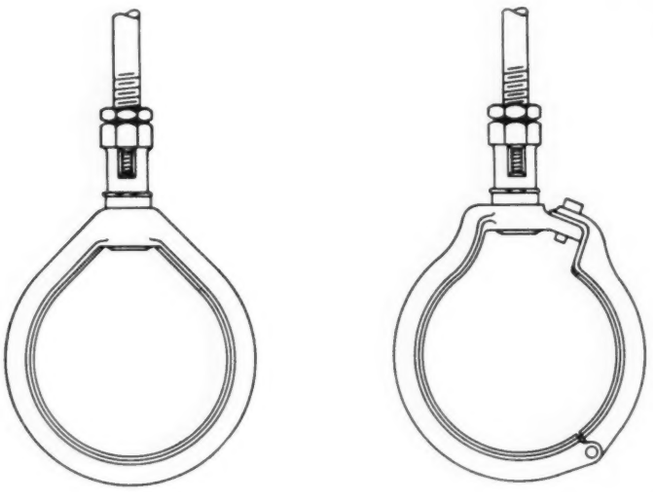


Fig. 17 and 18. Solid and split ring swivel type hangers.

The offset position of the arm hinge in the split type hanger provides sufficient seating to support the pipe before closing the ring. The split type ring simplifies the work of installation, as it may be installed after the pipe is in place.

Either of these hangers may be furnished with a

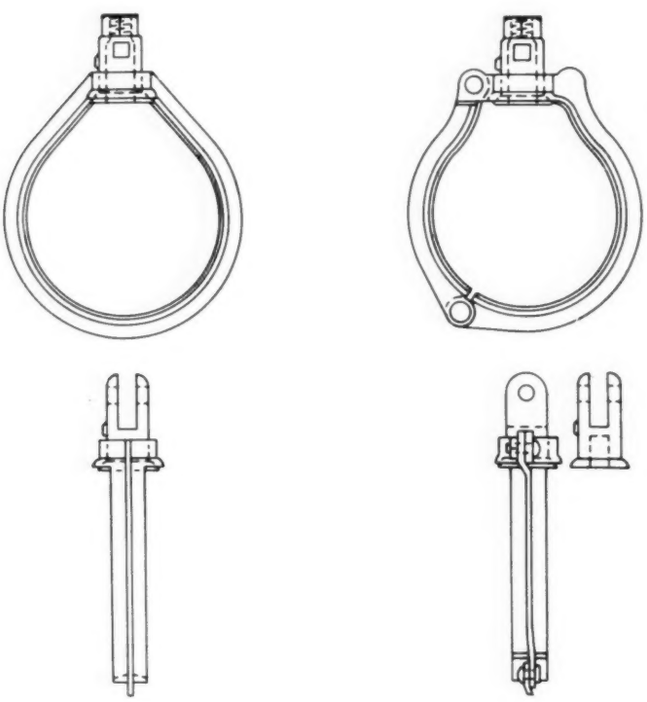


Fig. 19. Solid and split ring hangers provided with a clevis. The clevis types shown are interchangeable.

clevis for use with an extension bar or flat end bolt, Fig. 19, and can be obtained for pipe sizes from ¾ to 8-inch.

An adjustable self-locking hinged hanger is shown in Fig. 20. When closed, the two sections of the hanger are locked together by a series of teeth on the body and hinged section. After the pipe is in place, and the proper grade obtained by turning the adjustment nut, the hanger is locked by raising the hinged section to a horizontal position and closing with a sharp tap

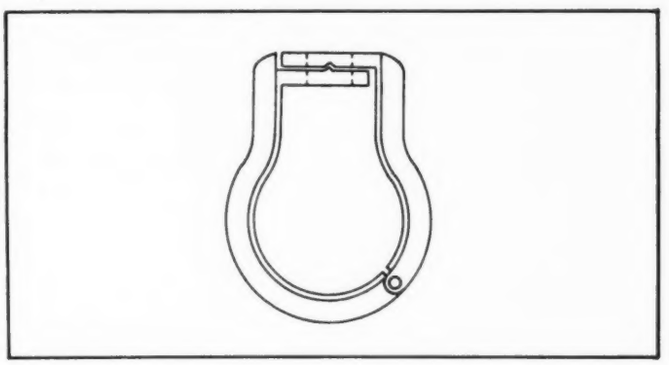


Fig. 20. Adjustable self-locking hinged hanger.

of a hammer. The hanger can be opened easily with a screwdriver, or before installation by simply tapping the hanger under the hinge on the floor, causing it to spring open.

Sprinkler System Supports

The installation of sprinkler systems is highly competitive and, in order to insure that the piping shall be properly installed to provide protection to the building when needed, codes governing this work have been prepared for the guidance of the engineers and contractors responsible for the design and installation of these systems.

These codes recommend that sprinkler piping should be supported by round wrought iron U-type or approved adjustable hangers, as shown in Fig. 21.

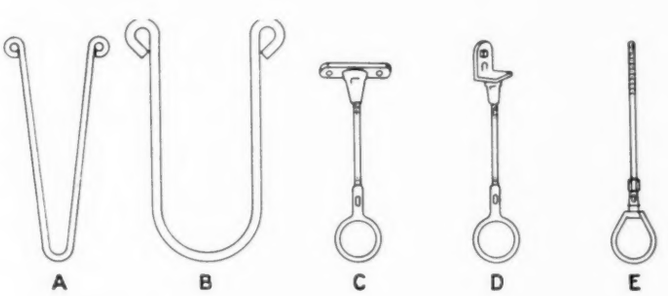


Fig. 21. Common types of acceptable hangers for supporting sprinkler piping: *A* — U-type hanger for branch lines; *B*—U-type hanger for cross and feed mains; *C*—adjustable clip for branch lines; *D*—side beam adjustable hanger; *E*—adjustable coach screw clip for branch line.

Wrought iron hangers are preferable to cast iron, and U-hangers as shown at *A* and *B* of Fig. 21 are for this reason best when their use is possible. Cast iron hangers or cast iron parts of hangers should be malleableized.

Pipe rings supported from coach screw hooks should be avoided and should never be used on branch lines.

Hangers which permit lateral motion of the pipe, particularly on branch lines, are not acceptable.

Standard Malleable Iron Pipe Fitting Allowances

RICHARD IRMITER

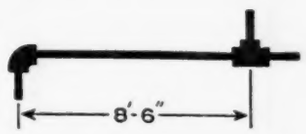
Cutting pipe to retain accurate center-to-center measurements in piping layouts requires correct allowances for fittings. Allowances for standard malleable iron fittings are shown in tables, and examples are given to demonstrate use of tables.

THE accompanying tables have been made up to eliminate guess-work in determining pipe lengths between fittings when designing piping layouts. When the center-to-center distance between two elbows, for instance, is measured, the question frequently arising is how much distance to allow for the elbows when cutting the pipe. Since the allowance varies with different types of fittings and for every change in pipe diameter, there are many different allowances to consider when laying out a piping system. The tables (p. 62) are for the fittings most commonly encountered in daily use. The drawings show banded fittings, but allowances for use with plain fittings are the same. Allowances are not given for valves, because of the wide variation in end-to-end dimensions of different makes and styles of valves.

Although most fittings made in the U. S. are made up to the same standards, it may be found that there are variations from the figures shown in the tables when it comes to making up joints. It must also be kept in mind that the dimensions given in the tables are based on certain conditions—commercially perfect threads on both the fittings and pipe, proper thread lubrication, the correct amount of torque applied to the wrench, and non-slipping teeth on the wrench. Some thread compounds furnish better lubrication than others, which causes variations in the amounts that joints can be taken up. The distances that threads are cut on pipe also vary, depending on who cuts the threads. It is best to consider the pipe lengths calculated from the tables as close approximations, and to expect discrepancies of several threads too short or too long when making up a joint. The individual can determine after using the tables for a while just how much, in his particular case, to add or subtract from the tabular values for joints in order to achieve center-to-center distances agreeing with his calculations.

Each value in Table 1 represents the distance from the center-line of the fitting to the end of the pipe screwed into the fitting. To determine the pipe length, this distance must be subtracted from the measured distance between the two center-lines for *both ends* of the pipe.

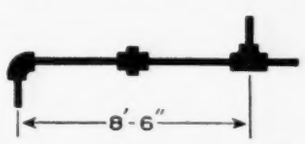
Example: The center-line distance between a tee and a 90-degree elbow in a 2-inch line is 8 ft 6 inches. According to dimension *A* in Table 1 the distance to subtract for the elbow is 1½ inches. The same for the tee. The total distance to subtract is the sum of the two fitting allowances, 3 inches, leaving an actual pipe length of 8 ft 3 inches.



Coupling Fitting Allowances

Dimensions *G* and *H* in Table 1 show the distance to subtract from pipe length where couplings or unions are inserted in the line. Table 2 shows similar allowances for reducers.

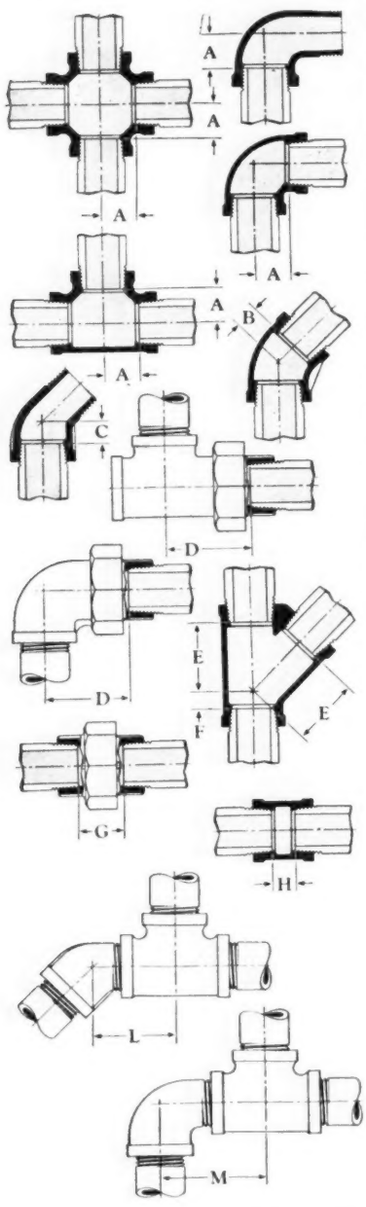
Example: Suppose it is necessary to use a union in the line in the previous example. The pipe length between the elbow and the tee must still be 8 ft 3 inches with the union added. To take an 8-ft 3-inch length of pipe, cut it, and insert the union would result in a length greater than 8 ft 3 inches. Additional shortening of the length is necessary. According to dimension *G* in Table 1 the necessary allowance for the 2-inch union is 1-13/16 inches. Subtracting this from 8 ft 3 inches gives us a total length of 8 ft 1-3/16 inches for the two pieces of pipe between the elbow and the tee.



Nipples

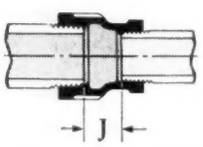
When distances between fittings are short, standard nipples can be used. Nipples are available in lengths up to 12 inches, with graduations at ½-inch intervals for shorter pieces and at inch intervals for longer pieces. (When no nipple is available in the exact length calculated, frequently the distance between fittings can be changed slightly to accommodate the closest available standard nipple size.) Each pipe diameter has a "close" nipple, lengths of which are given in Table 1. Shortest "long" nipple lengths for each pipe diameter

TABLE 1. STANDARD MALLEABLE IRON FITTING ALLOWANCES FOR PIPE MEASUREMENT



Pipe Diam.	Dimension Shown at Left										Close Nipple Length	Thread Engagement
	A	B	C	D	E	F	G	H	L	M		
	Inches											
⅛	7/16	¼	7/16					7/16	1¼	1 7/16	¾	¼
¼	7/16	⅜	¼	1 5/16			1	5/16	1⅜	1⅝	⅞	⅜
⅜	9/16	7/16	5/16	1½	1 7/16	5/16	1⅛	7/16	1⅝	2	1	⅜
½	⅝	⅜	5/16	1⅝	1 9/16	¼	1 9/16	5/16	1 13/16	2¼	1⅛	½
¾	¾	7/16	⅜	1⅞	1½	3/16	1 5/16	⅜	2 1/16	2⅝	1⅜	9/16
1	13/16	7/16	⅜	2 3/16	1¾	¼	1 9/16	5/16	2 5/16	2 15/16	1½	11/16
1¼	1 1/16	½	9/16	2½	2¼	7/16	1⅝	9/16	2¾	3½	1⅝	11/16
1½	1¼	¾	11/16	2 13/16	2⅝	½	1 11/16	¾	3⅛	3 15/16	1⅞	11/16
2	1½	15/16	15/16	3⅛	3¼	11/16	1 13/16	1	3¾	4¾	2	¾
2½	1¾	1			3¾	⅝	2 5/16	1		5 9/16	2½	15/16
3	2⅛	1 3/16			4 9/16	11/16	2 9/16	1 3/16		6⅝	2⅝	1
3½	2⅜	1 5/16									2¾	1 1/16
4	2⅝	1½			5 13/16	13/16		1 7/16		8 5/16	2⅞	1⅛
5	3⅛	1 13/16									3	1 1/16
6	3 13/16	2⅛									3¼	1 5/16

TABLE 2. STANDARD MALLEABLE IRON REDUCER COUPLING ALLOWANCES FOR PIPE MEASUREMENT



Large Pipe Diameter	¼	⅜	½	¾	1			
Small Pipe Diameter	⅛	⅛ ¼	⅛ ¼ ½	¼ ⅜ ½	¼ ⅜ ½ ¾			
Dimension J	⅜	½ ⅜	½ ⅜ ⅜	½ ½ ⅜	⅝ ⅝ ½ 7/16			

Large Diam.	1¼			1½			2				2½			
Small Diam.	½	¾	1	½	¾	1	1¼	½	¾	1	1¼	1½	1	1¼	1½	2
J	⅞	13/16	1 1/16	1⅛	1 1/16	1 5/16	1 5/16	1 1/16	1½	1⅜	1⅜	1⅜	1⅝	1⅝	1⅝	1 9/16

Large Diam.	3					3½			4				5	6
Small Diam.	1	1¼	1½	2	2½	2	2½	3	1½	2	2½	3	3½	4	4
J	2	2	2	1 13/16	1	2 3/16	2	1 15/16	2 9/16	2½	2 5/16	2¼	2 3/16	2¾	1 13/16

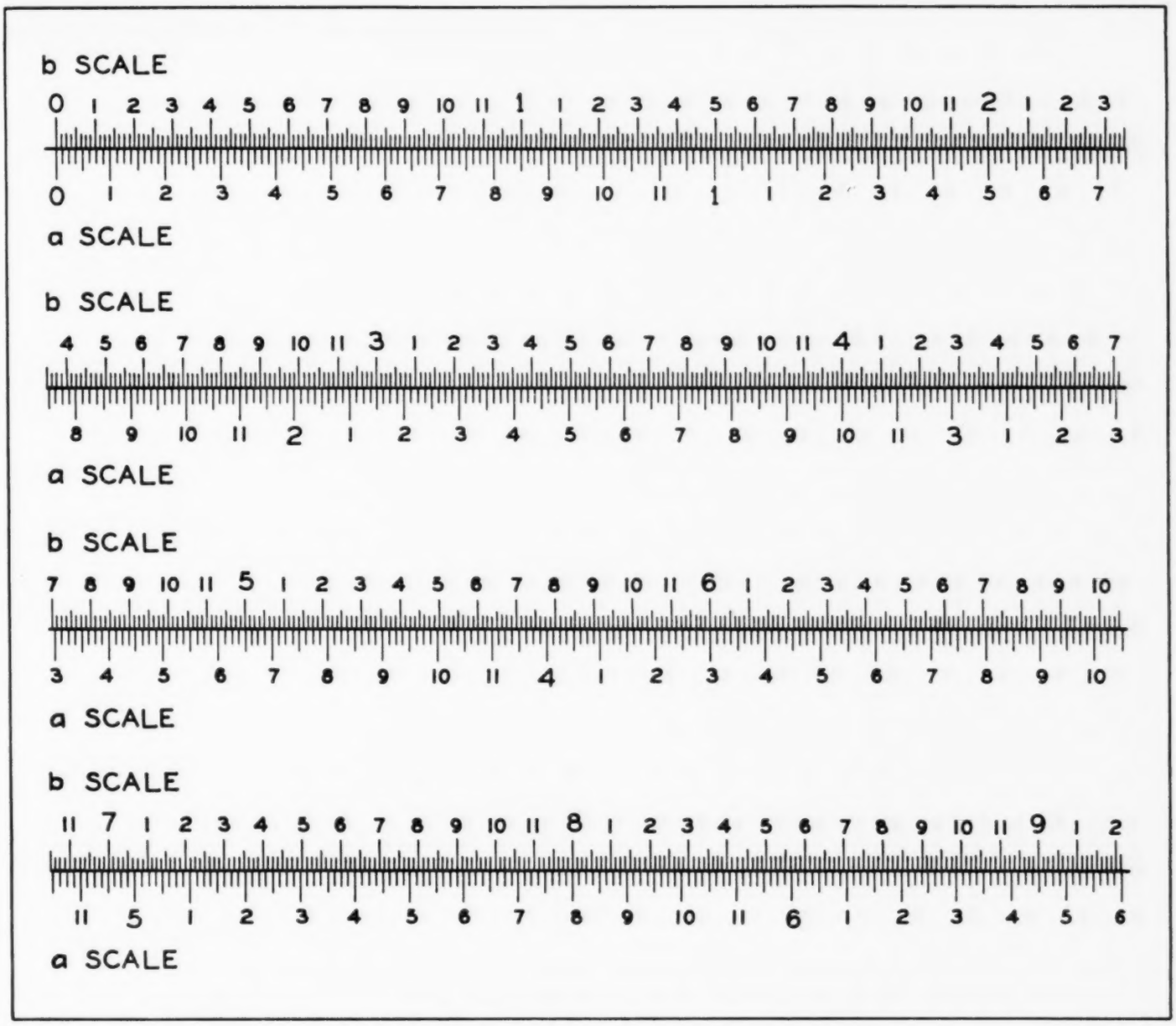


Chart of pipe length calculations for 45-degree offsets.

range from $\frac{3}{8}$ inch longer than the close nipple for the smaller pipe diameters to $1\frac{1}{2}$ inches longer for the larger pipe diameters.

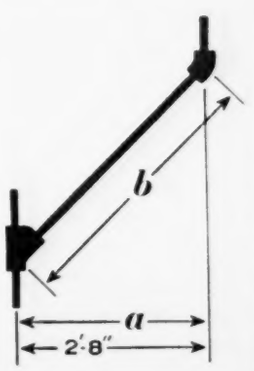
The "short" nipple, formerly an intermediate length between the close nipple and the long nipple, is no longer identified as such. It is now included in the long nipple group.

Offsets

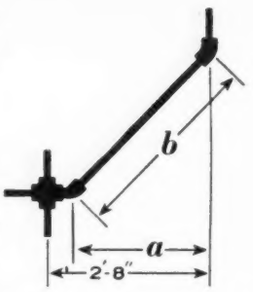
Dimensions *L* and *M* in Table 1 indicate the amount of "offset" to allow between center-lines when using street elbows, 90 degrees or 45 degrees. Supplementing the table is a chart of pipe-length calculations for 45-degree offsets. If the vertical or horizontal distance between center-lines of fittings is known, the length of the 45-degree measurement between fittings can be picked off the chart. From this measurement again must be subtracted fitting allowances taken from Table 1.

Example: A vertical $1\frac{1}{2}$-inch pipe line is to be offset 45 degrees, using two 45-degree elbows. The horizontal distance (*a*) between the center-lines must be 2 ft 8 inches. The diagonal distance (*b*) between the two center-lines, according to the chart, will be 3 ft $9\frac{1}{4}$ inches. From Table 1, dimension *B*, the fitting allowance to subtract for each 45-degree elbow is $\frac{3}{4}$ inch, a total of $1\frac{1}{2}$ inches. The actual length of the pipe between the elbows will be 3 ft $9\frac{1}{4}$ inches less $1\frac{1}{2}$ inches, or 3 ft $7\frac{3}{4}$ inches.

Example: A slight change in the above example makes use of a Y-bend. The fitting allowance for the Y-bend, from Table 1, dimension *E*, is $2\frac{5}{8}$ inches, which is greater than the 45-degree elbow allowance. The sum of the two fitting allowances is $3\frac{3}{8}$ inches, which is making the actual pipe length 3 ft $5\frac{7}{8}$ inches.



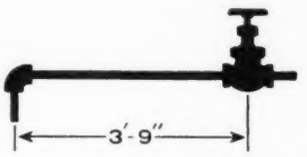
Example: A third example, somewhat more complicated, is shown here. A 45-degree street elbow is screwed into a cross. This shortens *a*, according to dimension *L*, Table 1, by 3⅛ inches. Distance *a* is now 2 ft 8 inches less 3⅛ inches, or 2 ft 4⅞ inches. Distance *b*, taken from the offset chart, is 3 ft 4¾ inches. Fitting allowances from Table 1 are 11/16 inch for the 45-degree street elbow (dimension *C*) and ¾ inch for the regular 45-degree elbow (dimension *B*), a total of 1-7/16 inches. Pipe length is 3 ft 4¾ inches less 1-7/16 inches, or 3 ft 3-5/16 inches.



Thread Engagements

Where valves are concerned, or where fittings not included in the tables are used, the table of standard thread engagements may be of help. The thread engagement distance subtracted from the end-to-center-line dimension of the fitting or valve (obtained by measurement) will give the amount to subtract from the pipe-line measurement in order to determine actual pipe length.

Example: The center-line distance from an elbow to a valve in a 1¼-inch line is measured as 3 ft 9 inches. The measured distance from the valve center to its end (half the end-to-end distance) is 2⅛ inches. From Table 1 the thread engagement for 1¼-inch pipe is 11/16 inch. The difference is 1-7/16 inches. This amount is to be subtracted from the pipe length at the valve end. At the elbow end, from Table 1, we subtract 1-1/16 inches. The total subtraction from the center-to-center measurement is 2½ inches. The actual pipe length will be 3 ft 9 inches less 2½ inches, or 3 ft 6½ inches.



How To Insulate Cylindrical Ducting

The Industrial Mineral Wool Institute offers a simple technique for applying insulation to cylindrical ducting. These units are often difficult to insulate because they are too large for preformed pipe insulation, the nature of the ducting prohibits the use of bolts, screws, or wires which puncture the duct surface, and the curvature of the surface is too great to permit insulation to be temporarily stuck in place prior to strapping.

One company easily solves the problem of insulating its high temperature duct leading to an exhaust fan this way.

(1) Dirt, grease, and other extraneous material is cleaned from the surface of the duct with a wire brush.

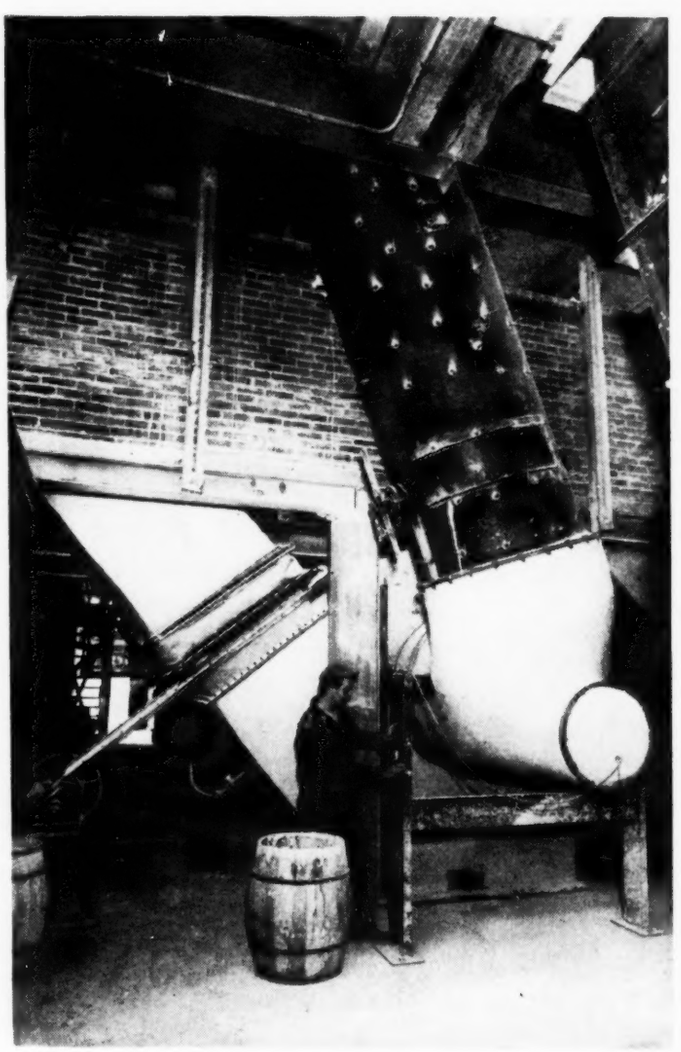
(2) Eight-inch lengths of galvanized wire are spot welded to the surface of the duct as shown in the photograph.

(3) One-inch thick mineral wool blankets, supplied sandwiched between expanded metal lath and light-gauge galvanized wire mesh, are impaled on the projecting wires. The expanded lath faces out and the protruding galvanized wires are bent over to hold the insulation in place.

(4) The sections of blanketing are laced together at the edges by galvanized wires entwined in the lath.

(5) Finally, the blanket is covered with a one-half-inch layer of mineral wool insulating cement trowelled over the surface of the expanded metal lath.

Although this particular job is to prevent excessive heat from radiating into the plant and making work areas uncomfortable for operating personnel, similar installations are often valuable fuel savers and increase the efficiency of operating equipment.



Insulating cement is applied as a finishing coat over the blanket sections.

Tailpipe Exhaust Systems for Garage Ventilation

MILTON SHEINBAUM* and ARTHUR C. STERN**
Division of Industrial Hygiene and Safety Standards, New York State Department of Labor, New York, N. Y.

Experimental work leading to establishment of design factors for tailpipe exhaust systems for automobile, truck and bus garages is described and a design procedure recommended.

MOTOR vehicle operations within a building present a potential health hazard. Carbon monoxide, nitrous oxides, aldehydes, and smoke are exhausted from the vehicle in varying proportions and quantities, depending upon engine design, fuel, air-fuel ratio, and engine condition. A typical passenger car operating under average conditions will exhaust about 165 cu ft of gas per pound of fuel. These exhaust gases may contain 5 to 6% of carbon monoxide. Under these conditions, a car which goes 15 miles per gallon of gasoline, and which is traveling at a speed of 45 miles per hour, will produce 50 cu ft of exhaust gas per minute, 2½ cu ft of which will be carbon monoxide. Heavy trucks and buses will exhaust between two and four times these amounts.

Motor vehicles, which are operated within buildings, either move very slowly or are motionless with the engine operated at various speeds. For the most part, they are being "warmed up" for the day's work, parked for the night, tested, or repaired. Under these conditions, the quantity of exhaust gases may decrease 50% while the percentage of carbon monoxide in the exhaust gas may be increased to as much as 10%.

In bus and fleet garages the problem of exhaust gases is mainly that of starting and warming up large numbers of vehicles within the building in the early morning, and parking them at night. Peaks of activity are found to exist in the early morning and again in the evening. These peaks may persist for as long as an hour. The problem is usually less severe in transit garages since activity is frequently spread throughout the day.

The only solution to this problem appears to be general dilution ventilation at the rate of 10,000 cfm per vehicle in motion at any given time, as suggested by Berger in U. S. Bureau of Mines Circular 7404.

A second type of exhaust gas problem exists when vehicles are operated at fixed test or repair locations in garages or repair shops. The vehicles may be over a grease pit, on the floor, or elevated on jacks or a lift. In all such cases local exhaust ventilation should be provided.

Pits where the mechanics are required to work under the vehicle may be ventilated by an exhaust port in the tail end wall or by a series of exhaust ports along one or both side walls. Grease pits should be ventilated at a rate of not less than 100 cfm per foot of length of the pit.

Tailpipe Exhaust Systems

Tailpipe exhaust systems are applicable to cars at grease pit, floor, or elevated locations. Such systems are built in two principal arrangements, the overhead and the under floor types. The overhead system is a conventional exhaust system using metal piping suspended from the ceiling or roof and terminating in flexible pipe branches. The branches may be either suspended directly from the main or connected to a solid metal branch running down from the overhead main to a point near the floor. The flexible pipe is usually arranged with rope and pulley so as to be lifted out of the way when not in use.

*Industrial Engineer.
**Chief, Industrial Hygiene Engineering Unit.

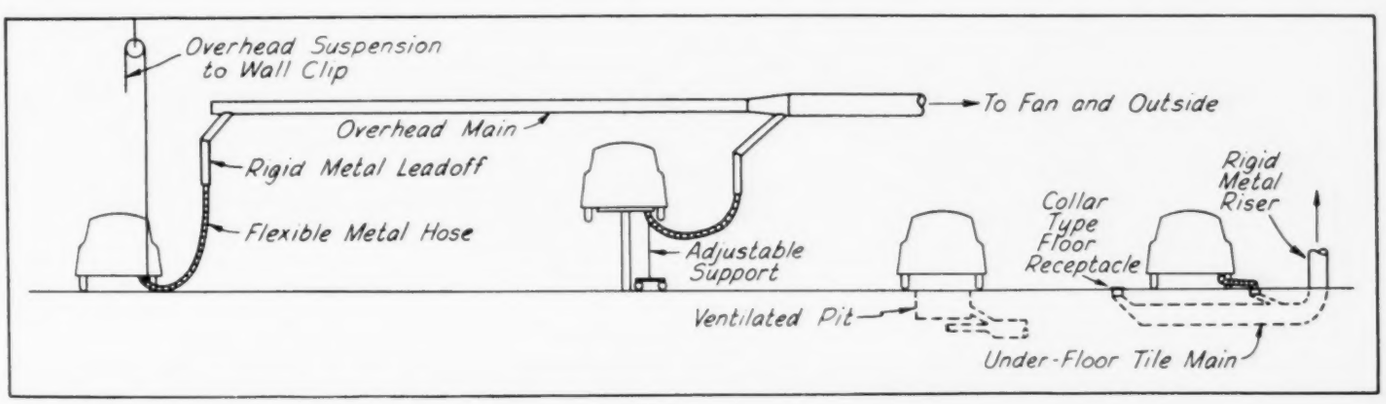


Fig. 1. Various practicable systems for tailpipe exhaust ventilation.

TABLE 1—DESIGN REQUIREMENTS FOR TAILPIPE HOODS

Vehicle	Hood	Hood Face Area, Sq Ft	Total Vol., CFM	Flex. Pipe Dia., Inches	Loss in Flex. Pipe, Inches H_2O Per Ft	Volume Open Hood, CFM	Hood* Static Pres., Inches H_2O
Auto	2½-inch pipe	0.034	50	2½	0.018	40	0.38
Auto	Sheet metal	0.15	100	3	0.044	92	0.29
Truck	4-inch pipe	0.087	150	4	0.013	140	0.58
Bus	Special hood	0.296	250	4	0.029	230	0.57

*Measured hood static at maximum design operating conditions.

Under floor systems are commonly constructed of 6-inch tile pipe, laid into the cement floor slab, and terminating in special floor plates at each location. Two types of floor plates may be used. The first forms a collar to which a flexible pipe can be connected. The pipe must then be stored elsewhere when not in use. The second type allows the flexible pipe to telescope inside the under floor tile pipe for storage when not in use. It is necessary to use twice as much air with a telescoping branch as with a fixed or tight collar branch, since, as shown by our tests, there is 50% air leakage into the floor plate when it is in use. Both single and dual pipe connection plates are available. A general layout of these different types of connections appears in Fig. 1.

All tailpipe exhaust systems, just as other types of exhaust systems, require a fan to provide the air movement, a hood, suitable piping, and weather protection at the discharge end. The important factors in the design of such systems are the shape and size of the hood, the quantity of air flow required and the resistance of the system as a whole.

Automobile tailpipes vary in diameter and are frequently fitted with deflectors and ornaments. A hood must of necessity be of sufficient size to slip over such fittings and be supported by the tailpipe. Otherwise, the fitting must be removed or the hood supported in position by an adjustable stand. A design of a preferred type of hood appears in Fig. 2.

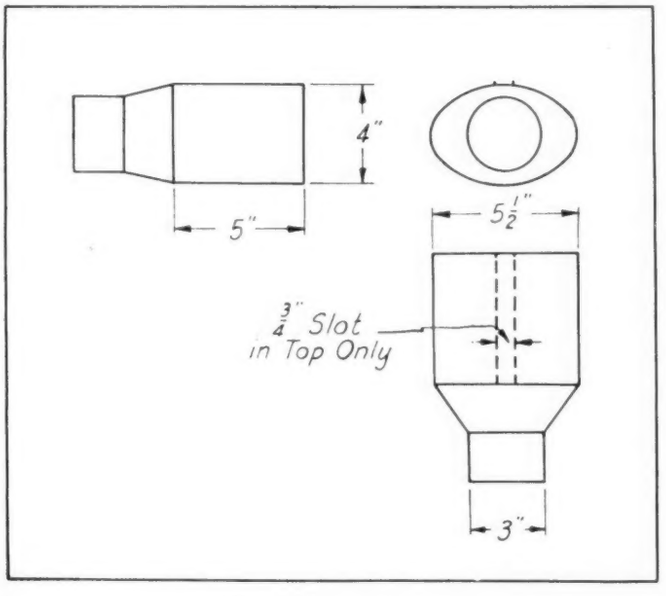


Fig. 2. Design of a preferred type hood.

Tests of Tailpipe Exhaust Systems

To determine the total air quantity required for ventilation, a series of tests were run in which the quantity of air and exhaust gas flowing through the flexible pipe section of tailpipe exhaust systems were measured by a pitot tube. The quantity of air was varied by means of blast gates inserted into the line. Tests were run with different sizes and types of engines; at different engine speeds; and with different hood types.

In all cases, the air quantity exhausted by the hood under test was gradually increased from zero to the minimum quantity at which control of the tailpipe effluent was adequate. Adequacy of control was determined in two ways; visually, by noting when no smoke escaped from the hood, and instrumentally, by use of the MSA carbon monoxide meter, holding the sampling tube inlet in the gap between the hood and the tailpipe. Improvement in control was indicated by decreased readings with adequate control being reached at 100 ppm of carbon monoxide.

These measurements included, when possible, velocity of gas from the tailpipe and hood face velocity. A relationship was found to exist between the required control velocity and the velocity of gas from the tailpipe. This relationship is illustrated in Fig. 3. Tests to determine the resistance of various types and sizes of flexible pipe were made. In all cases, air velocities were measured with a pitot tube and draft gage and the resistance was taken over a measured length of pipe.

Tailpipe Hood Designs

The elliptical hood, illustrated in Fig. 2, was the only one found to fit conveniently over all deflectors and ornaments which were encountered. When constructed of sheet metal, it has a relatively low resistance, is light, easily handled and does not retain heat very long. It has two definite disadvantages, its large size and the fact that the joints cannot be soldered since the solder tends to soften and melt with prolonged use. The first disadvantage cannot be corrected since the size is required for proper fitting, but the second objection can be overcome by welding the joints instead of lapping and soldering.

An elliptical cast aluminum hood of about the same size and shape was tested but found inferior to the sheet metal hood because of its weight. Other shapes of hood would not fit over all types of deflectors and ornaments, and one, a cloth sack, collapsed during the test. The use of a length of 2½-inch I.D. flexible pipe as a hood is satisfactory for most automobiles without deflectors or ornaments, but is too small for the new,

heavier car, heavy truck or bus. A 3-inch I.D. flexible pipe, however, will slip over the tailpipes of all cars and light trucks without tailpipe ornaments. A special rectangular hood connected to a 4-inch I.D. flexible pipe supported on a special stand is required for buses.

Passenger Cars and Light Trucks

The volume of exhaust gases generated at medium engine speeds may be selected as an exhaust system design basis since when the car is being repaired or tested engine racing is rare and of short duration. A hood face velocity of about 400 fpm will control the gases exhausted from an engine operating at medium test speeds. The total volume is the sum of the control air (hood velocity times face area) and the volume of gases exhausted by the car. A sheet metal elliptical hood having 0.15 sq ft net face area will require 0.15 × 400, or 60 cfm control air. The total volume of gases exhausted from a light automobile operating at about medium speeds is about 30 cfm. The total volume required is therefore 90 cfm.

If all ornaments and deflectors are routinely removed from the auto tailpipe before working on the car and if only light or medium cars are handled, a 2½-inch I.D. flexible pipe could be used as a hood with a control air requirement of .034 × 400 = 13.6 cfm and a total volume of 43.6 cfm.

The flexible pipe should be double locked, asbestos packed, metal pipe of sufficient size to carry the required air flow without excessive resistance. Since the resistance of the pipe depends on the velocity of air flow, diameter, and length, a low pipe velocity is desirable. By calculating the resistance per foot for both the 43.6 cfm and 90 cfm loads in 2-, 2½-, 3- and 3½-inch flexible pipes, it can be seen that the optimum size to use is the 2½-inch pipe for the 45 cfm load with .015 inch w.g. resistance per foot and the 3-inch pipe for the 90 cfm load with .036 inch w.g. resistance per foot. As long as the lengths of flexible pipe are reasonable (under 15 ft) the total resistance of the system can be kept fairly low.

Buses and Large Trucks

The special hood used for the bus was relatively the same shape as the elliptical hood illustrated in Fig. 2, except that the face was rectangular and larger, the face area being 0.296 sq ft. This special hood was required because of the rectangular shape of the exhaust manifold. This hood required 0.296 × 400 = 118.4 cu ft control air. The volume of discharged gases was 110 cu ft, therefore, the total volume required was 228.4 cu ft. A 4-inch I.D. flexible pipe was used with the bus hood with a resistance of 0.025 inch w.g. per foot. Large trucks fall into about the same category as buses insofar as the volume of exhaust gas is concerned. Since this type of vehicle usually has an exhaust pipe which is not encumbered with ornaments, a suggested hood would be the open end of a 4-inch I.D. flexible pipe. Control volume would then be 0.087 × 400 = 34.8 cfm, and the total volume would be 114.8 cfm. The flexible pipe resistance would be 0.012 inch w.g. per foot. If an under floor, self-storing system is to be used, the air quantities required for control would be double the air quantity required for a fixed tailpipe exhaust system, unless some means of reducing the observed air leakage between receptacle and pipe can be devised.

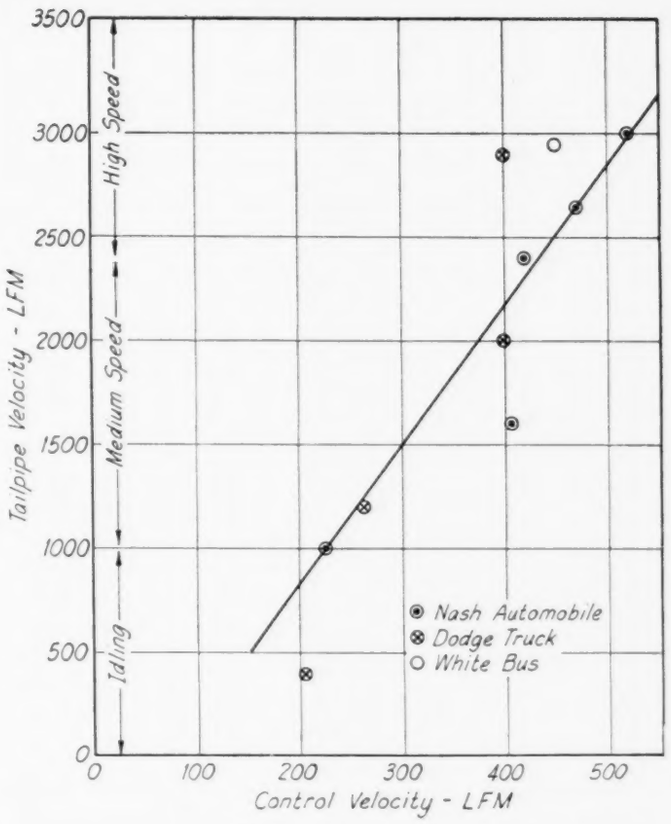


Fig. 3. Control hood face velocities at various engine speeds.

Design of Tailpipe Exhaust Systems

A forward curved fan may be used. Its required capacity and the size of the main leading to it depends upon the total number of connected branches, the maximum number of them likely to be in simultaneous

TABLE 2—RECOMMENDED SOLID METAL PIPE SIZES

Vehicle	Hood	Branch Dia., Inches	2-Branch System	3-Branch System	4-Branch System	8-Branch* with Closures	10-Branch* with Closures	8-Branch System, Open
			Main Pipe Diameter, Inches					
Auto	2½-inch pipe	3	4½	5½	6	6	7	9
Auto	Sheet metal	4	6	7	8	8	9	11
Truck	4-inch pipe	4½	6½	8	9	9	10	13½
Bus	Special hood	5½	8	9½	11	11	12	15½

*All hoods provided with full automatic positive closures.

TABLE 3—RECOMMENDED DESIGN FOR UNDER FLOOR 6-INCH TILE SYSTEM—TWO RUNS*

Type	Hood	Flexible Pipe, Dia., Inches	Number Floor Plates		Riser Dia., Inches
			Closed	Open	
Tight Fit Collar	2½-inch pipe	2½	10	5	8
	Sheet metal	3	8	4	8
Self-Storing	2½-inch pipe	3	8	4	8
	Sheet metal	4	—	2	8

*Under floor tile pipe system not recommended for trucks or buses.

use, the type of hoods used and the type and extent of closure used on these hoods when not in service. Where up to four branches are installed, all of them should be assumed to be in simultaneous use in even the smallest shop. Where more than four branches are installed, a good working rule is that only half of those installed, but not less than four, be considered in simultaneous use unless there are obvious indications to the contrary. Those assumed to be in simultaneous use must each be figured to require the previously indicated capacity: 90 cfm for a standard elliptical hood; 45 cfm for a 2½-inch I.D. open end pipe (where no deflectors or ornaments are encountered); and 145 cfm for heavy duty hoods. These quantities should be doubled in the case of under floor self-storing systems.

The air quantity that must be allowed for each branch installed in excess of the number on the basis of which the system is designed depends upon the closure of the hood or branch terminal. Where such closure is positive and complete (i.e. a spring loaded solid metal cap) no additional capacity need be provided for these additional branches. Where such closure is positive but incomplete (i.e. a spring loaded perforated metal cap) fan capacity must be provided for the air quantity entering each branch through the opening remaining after closure. In a self-storing type of branch with closure in place, this amounted to 55 cfm at 3.60-in. w.g. static pressure in the branch. Lastly, where no closure is provided on these extra branches, each must be figured as an open hood.

Under floor systems frequently use 6-inch tile pipe laid out in runs radiating from a rigid metal riser. In such cases only two open branches may be connected to each tile pipe run. If two or more tile runs are connected to the riser and if positive, complete closures are provided at the floor plate, four 3-inch or five 2½-inch branches may be connected to each 6-inch tile pipe run. Under floor systems using tile pipe are not recommended for heavy load hoods.

Summary

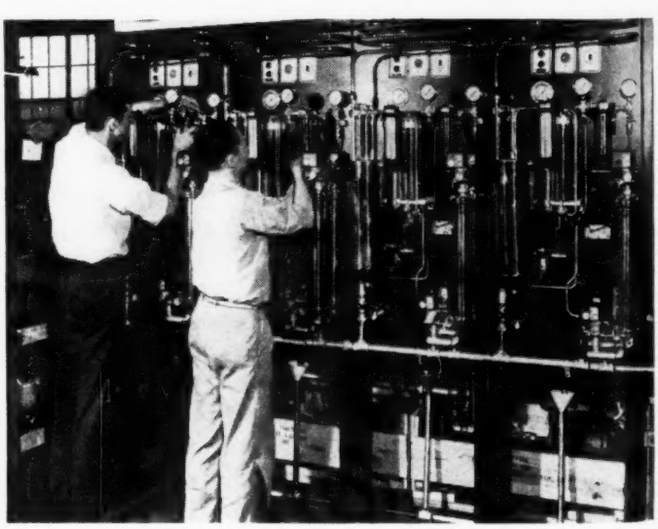
Tables 1, 2, and 3 summarize the required total volumes and the volume of air flowing into the open hood, the size and resistance of the flexible pipe and the size and number of branches recommended for the various conditions encountered during this investigation.

CO_2 Indicator Guards Holland Tunnel

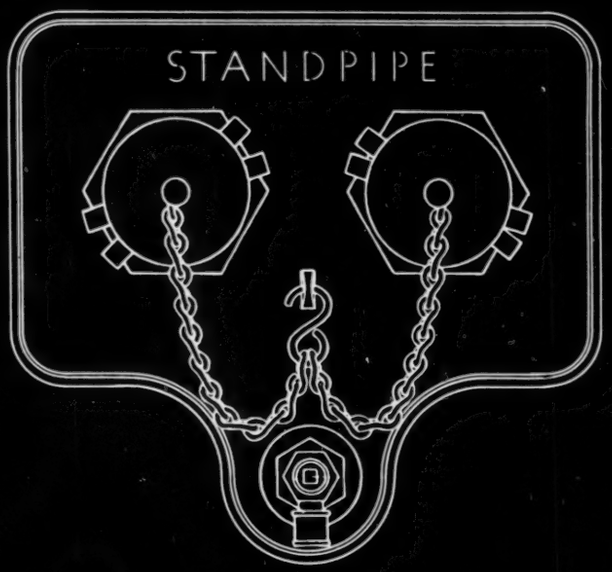
New instruments so sensitive they can detect as little as one part of deadly carbon monoxide in a million parts of air are being installed by the Port of New York Authority to control the ventilation system in the Holland Tunnel. The equipment, manufactured by Mine Safety Appliances Co., Pittsburgh, will replace similar instruments installed by that company in 1927 when the tunnel was built.

Samples of tunnel air are taken continuously from 14 different locations and analyzed by the instruments. When carbon monoxide concentrations exceed a predetermined limit, the huge ventilating system for the tunnel is speeded up, according to the discretion of the supervisor on watch, to supply additional quantities of fresh air at the points requiring it. In addition, the instruments provide a permanent record of varying concentrations of carbon monoxide in the tunnel.

Among improvements in the new equipment is a reduction in size and maintenance requirements and the installation of a system of automatic regenerative dryers for removing water from the air samples before they are analyzed. In the original instruments, sulphuric acid employed for this purpose had to be replaced frequently. Glass flowmeters and pressure regulators for controlling the rate of sample flow have been replaced by simplified modern control devices.



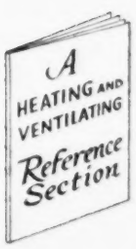
Three instruments each will be installed in two of the tunnel's four ventilating stations, and four instruments go into each of the other two. In each building also there will be one calibration panel used to periodically check the accuracy of the analyzers. One of the 15 analyzing instruments will be kept on hand as a spare.



Standpipes for Fighting Fires in Multi-Story Buildings

MORTIMER FREUND

Member of Eadie, Freund and Campbell, Consulting Engineers, New York, N. Y.



Standpipes for Fighting Fires in Multi-Story Buildings

MORTIMER FREUND

Member of Eadie, Freund and Campbell, Consulting Engineers, New York, N. Y.

Standpipe systems provide a primary means for fighting fires in multi-story buildings. The design of such systems is predicated on a number of rules and regulations established by governmental agencies and fire insurance interests. The design details and piping requirements described are based on these regulations.

FIRE-FIGHTING equipment for buildings can be generally classified in one of the following groups:

(1) Fire hydrants outside of the buildings, together with hose either regularly attached to the same or placed on mobile carts ready for attachment.

(2) Standpipe systems within the buildings with hose regularly attached to outlets located at strategic points throughout the building.

(3) Sprinkler systems having discharge heads or nozzles on fairly close spacing.

(4) Portable hand extinguishers.

(5) Mobile (wheeled) extinguishers.

The first three of these systems require a source of water sufficient for a continuous flow of water over a prolonged period of time.

Yard Hydrant Systems

When fire-fighting facilities are to be provided for a large group of industrial, commercial or institutional buildings under the same management and located in a common yard or enclosed area, or in amusement and exhibition parks, an underground main is installed in the yard or enclosure surrounding the group and passing between individual buildings, so arranged as to form a closed ring. Branches from the main serve hydrants located at strategic points for directing streams of water by means of hose, against and into the buildings. This ring main is so sectionalized that, in the event of a break in the main, the affected section can be shut off leaving the rest of the main in use.

Standpipe and automatic sprinkler systems inside of the buildings are supplied from such underground mains. While separate mains were formerly provided for supplying fire hydrants and standpipes as distinct from those supplying the sprinkler system, it is now the general practice to have a common ring main for supplying all of these systems.

Fire hydrants of required size are provided with at least two outlets for 2½-inch hose. Each hydrant is enclosed in a housing with doors. Shelves are provided on which lengths of hose are stored in coils. The hose is usually canvas rubber-lined, in 50 ft lengths and with suitable couplings at each end. Three such lengths, for example, are left coupled and connected to one of the hydrant outlets, with additional lengths placed on the shelves. A complement of tools, as required by the authorities, is provided. If necessary, where coupling threads are different from the fire department specifications, adaptors are provided to permit the community fire department to connect their lines to the hydrants.

Control valves are of the post-indicator type with the top of the posts, or housing which surrounds the valve stem, about 3 ft above grade. Valves should never be located in front of building windows or doors, if within 40 ft of the building walls. They should, however, be located between windows or opposite windowless sections of wall, so that they will not be in the path of flames and smoke that may issue from such openings.

In low buildings, outlets to take fire-fighting hose are sometimes provided in the cold water distribution mains inside the building. In some cases, 1½-inch outlets and hose have been used, because it is easier to handle when discharging water under pressure, but 2½-inch hose is standard. In general, the smaller size hose is not accepted by the authorities as providing proper protection.

Mobile hose carts are frequently provided which carry reels of hose to be attached to the fire hydrant or other hose outlets, and thus wheeled close to the fire for effective fire-fighting.

Interior Fire-Fighting Systems

As buildings have increased in area, height and number of stories, it has become increasingly necessary to have within each building a large supply of water for fighting fires quickly, and effectively available throughout the buildings. Two general types of fire-fighting systems have been developed, the standpipe and hose system, and the automatic sprinkler system.

In certain types of buildings one or the other is installed, in some both. Installation may be mandatory under local, state or national ordinances, or it may be a necessary requirement in order that the owner or tenant can (1) obtain fire insurance; (2) secure a lower fire insurance rate; or (3) increase the permitted number of occupants.

Standpipe Systems

It is informative to quote from the Standards of the National Board of Fire Underwriters as recommended by the National Fire Protection Association:

"Next to the automatic sprinkler equipment, a well designed, properly equipped, and reliably maintained standpipe system constitutes the best means for the extinguishment of fires in buildings. Each of these equipments is capable of furnishing a class of service of which the other is incapable, and, in most cases, they should be made to serve as complements of each other. The standpipe system furnishes the only reliable means of obtaining effective fire streams at the upper stories of high buildings, and of furnishing such streams in the shortest possible space of time."

Standpipe and hose systems, as usually installed, are systems of piping in buildings, exclusively used for fire-fighting, supplied with water from one or more sources, with the supply valves in the connections from such sources always open and the required water pressure maintained at all times. This system of piping includes distributing mains (fire lines) feeding one or more standpipe risers (generally called standpipes) extending to the roof in multi-story buildings, with valved outlets in these at all floors to which a hose line with nozzle is attached. In single-story buildings, the hose outlets are taken directly from the mains. In addition, connections are run from the fire line to the exterior of the building, where generally 2-way, sometimes 3-way (siamese) hose connections are provided so that the local fire department pumpers can be connected by a hose line to supply the system with water after storage facilities might be exhausted.

To quote again from the Standards: "They (standpipe and hose systems) are designed:

(1) For use by fire departments and those trained in handling heavy fire streams.

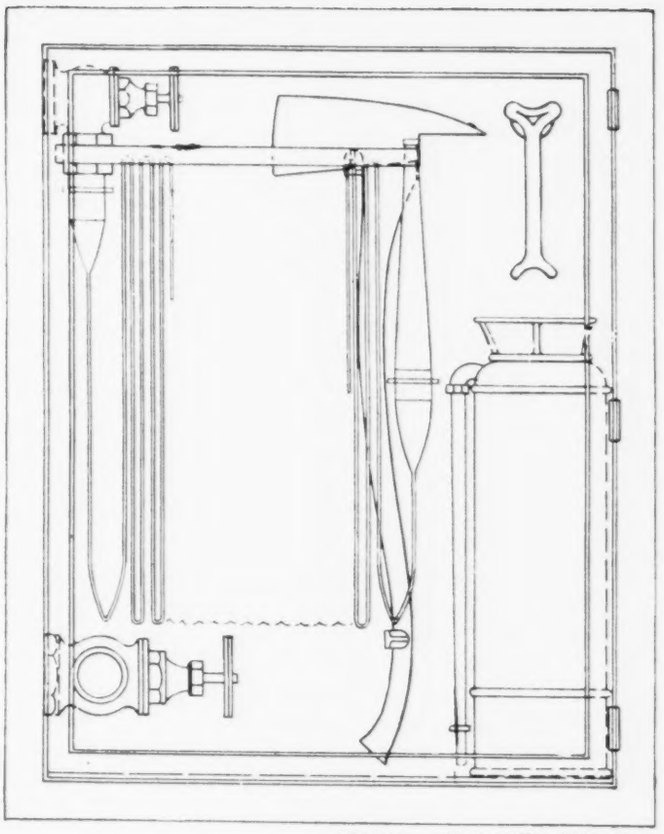
(2) For use by the occupants of buildings as first-aid fire protection.

(3) For both of these classes of service."

This should indicate the importance of designing, installing and maintaining such systems in accordance with the requirements of the local ordinances relating thereto.

There is, perhaps, no more comprehensive exposition of the principles and methods to be followed in planning and installing standpipe systems than Article 17 of the Administrative Building Code of the City of New York. These regulations were enacted in substantially their present form 12 years ago. A few amendments have been added since then, incorporating the actual experience of men skilled in fighting fires, fire prevention experts, and engineers and architects engaged in the design of buildings. In New York City are buildings of practically every type — large and small area and heights which in some cases exceed 1,000 ft. Traffic conditions emphasize the need for effective standpipe systems to suit the varying conditions which have to be met. Other localities may offer some variations, but the New York rules afford an excellent basis of treatment.

Under these rules all buildings which exceed 75 ft in height (85 ft in height for buildings erected prior to 1938), are required to have standpipe systems, and all buildings of less height but more than one story and having a net area of more than 10,000 sq ft on any floor. It should be understood that, if there are fire walls dividing a building into sections, this figure



Courtesy, W. D. Allen Mfg. Co.

Fig. 1. Cabinet fitted with hose, angle valves, axe, spanner and fire extinguisher.

applies to any section enclosed by such fire walls and the exterior walls, the area of which exceeds 10,000 sq ft.

Standpipe systems are also required in special occupancy structures which are defined as those "intended to be used for entertainment or instruction of any kind . . . for the accommodation of more than 300 persons." In cases where a structure requiring a standpipe system is built over an auditorium, also requiring a standpipe system, such systems must be entirely separate.

Certain buildings are excluded from these categories and are not required to have standpipe systems. Among such, under the New York City rules, for example, are: (1) structures less than two stories or 25 ft in height, 20,000 sq ft or less in area, the occupancy of which is not ruled highly hazardous; (2) structures less than 6 stories or 75 ft in height, not adjudged to have highly hazardous occupancy and provided throughout with an automatic sprinkler system supplied from two sources; and (3) schools not more than 5 stories in height, in which are conducted regular, supervised fire dismissal drills for pupils. Under certain circumstances in the last case, however, standpipe and hose systems are required for auditoriums in such schools. It goes, almost without saying, that the necessity for installing a standpipe system should be discussed with all of the public authorities having jurisdiction as well as the fire insurance authorities.

Risers and Hose Outlets

A sufficient number of standpipe risers must be provided, so located that any part of the building, with the exception of small housings on the roof, will be within

120 ft of the riser, at most, measured horizontally, so that a hose not over 100 ft long will be effective. Standpipes should be located inside of fireproof stairway enclosures or fire towers, so that the hose attached to the outlet and the valve admitting water to it will be outside of the area in which the fire is occuring. This makes it possible for the building employees to work in a relatively safe smoke-free space to prepare the hose for fighting fire. Another feature is that the hose will be available to the community fire fighters ascending the stairway before they enter the fire area. The stair enclosures should be heated to prevent freezing. Sometimes it will be necessary to install additional standpipes or branches from stair risers, with additional hose outlets within the general floor area, so as to provide full coverage.

In special cases, a hose 125 ft long is permitted, but the end of the hose nozzle must reach within 20 ft of the furthest point in the area served. If the floor area is sub-divided by partitions, the bending of the hose to permit passage through door openings in partitions must be taken into account in allowing for the effective distance through which the hose can be manipulated, and the standpipes or floor hose outlets spaced accordingly. Hose outlets are usually located 5½ ft above the floor or stair landing, but never more than 6 ft.

Hose, 2½-inch unlined linen, in 50 ft and 25 ft lengths, is used in buildings with standard standpipe systems. The lengths required are coupled together, with one end connected to the outlet control valve and the other end fitted with a heavy nozzle. This is the largest diameter hose which is capable of being manipulated under the water pressure used. The hose is hung in folds on a swinging rack attached to the standpipe and fitted with non-detachable pins to support the folds. More than one man is required to manipulate successfully hose of this size. Unlined hose has longer life in a dry, heated atmosphere and is therefore now generally used, excepting where special conditions dictate the use of rubber lined cotton hose or rubber hose.

Where hose outlets are located in decoratively treated spaces, such as theaters, auditoriums, lobbies, and corridors, the outlet, valve, hose rack, hose and spanner are enclosed in a specially designed cabinet, recessed in the wall, so as to finish flush with the wall. Such cabinets are provided with a single swinging door, unlocked at all times and equipped with a large panel of clear wired glass. Under special, approved conditions, solid metal doors may be used. Such cabinets are also built to accommodate, in addition to the items mentioned, a portable hand-operated fire extinguisher and fire axe and, in some localities, an additional capped hose outlet valve. See Fig. 1.

For aid in fighting fires from the roof of the building, a manifold containing three 2½-inch valved hose outlets, provided with screwed-on caps, should be installed at the top of at least one standpipe riser, and on others if conditions require. These manifolds permit fire fighters to attach their portable hose quickly upon ascending to the roof. The manifolds should be placed in heated bulkheads opening onto the roof at the top of the stairways. If the manifold must be located in an unheated space, a control valve should be located in a heated space below with a long stem extending up through the roof to an operating wheel handle and provision made for draining off water left between the manifold and the valve.

Standpipe risers are required to be 4 inches in diameter in buildings 150 ft or less in height. For higher buildings, which may be divided into separately supplied vertical zones (to be described later), the required size in each zone is 6 inches or 8 inches. The full size is maintained throughout. Branches from standpipes to hose outlets are 2½ inches, if less than 4 ft in length; 3 inches up to 25 ft in length; and 4 inches, if of greater length.

Single Riser System

The simplest standpipe system consists of a single standpipe riser connected at the top to a tank elevated above the roof so that its bottom is 25 ft above the highest hose outlet, other than roof outlets. If, however, there is a large penthouse at the roof level used for general occupancy and provided with hose outlets, the tank must be elevated to the required level above these outlets. If the top of the building has a tower or is pyramidal in shape, the tank must be located as high as possible therein, but at least 25 ft above the highest hose outlet. The bottom of this riser is extended at the ceiling of the lowest story out to the exterior of the building, terminating in a siamese connection to which the community fire department can attach its hose and pump water into the standpipe system. A gate valve, sealed open, is placed between the bottom of the roof tank and the standpipe. Below it is a check valve which will permit the flow of water from the tank, but will prevent water being pumped into the tank via the street siamese, which might result in flooding and water waste.

If there are more than one standpipe risers, all of these are cross-connected at the bottom into a common main (frequently called the fire line) run along the ceiling of the lowest story, into which connections are made from one or more street siameses and from which connections are made to all hose outlets located below the level of the cross-connecting main. Generally, only one standpipe riser is connected to the roof supply tank or tanks, but occasionally there is a separate roof tank feeding each standpipe. The cross-connecting main must be at least the size of the largest standpipe riser, but when connecting two or more 4-inch standpipe risers, it must be at least 5-inch and the branches to the street siameses must be 5-inch. Branches must be 6-inch if the cross-connecting main is 6-inch or larger. Such system are shown in Fig. 2 and 3.

In single riser systems supplying outlets more than 150 ft above grade, control valves are installed in the riser at intervals of approximately 150 ft for isolating other sections of the riser in the event of a break in one. In the horizontal cross-connecting main, control valves are also installed to permit isolating sections of the main in the event of a break.

In each standpipe riser of a multiple riser installation, a riser control valve is installed in the riser within the stair enclosure, and below the lowest hose out-

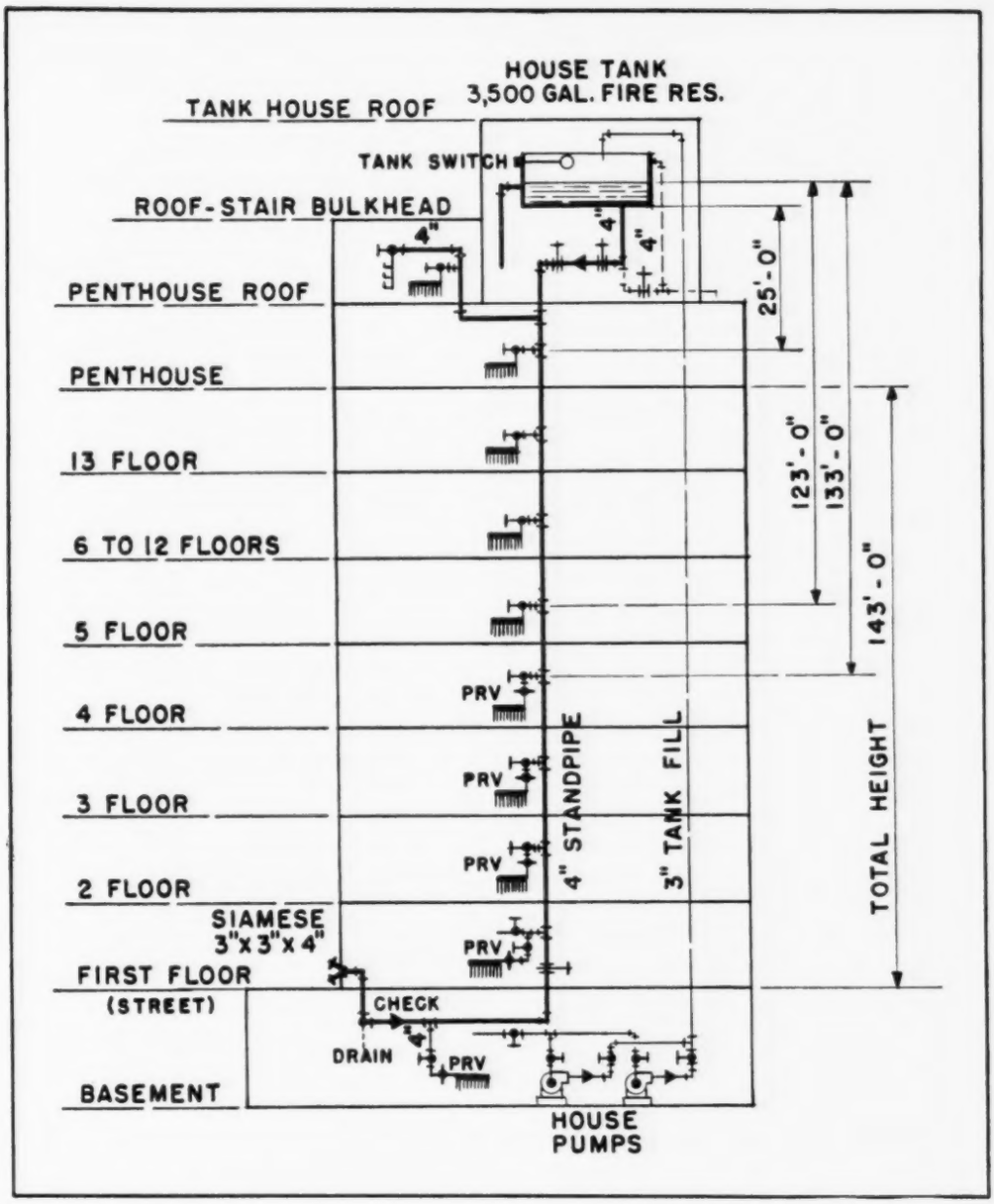


Fig. 2. Details of a single stand-pipe system supplied from a roof tank.

let wherever possible, so as to be easily accessible. This permits the riser to be isolated from the rest of the system in the event of a break in the riser itself or in the event that a break occurs in the cross-connecting main or another riser. So that the riser will not be rendered useless in the latter event, an additional valved hose outlet is provided just above the control valve, without hose and capped. To this outlet the fire department's pumper can be connected and the isolated standpipe riser kept in service.

Roof Tanks

For any standpipe system, supplied by gravity from a roof tank, there must be an otherwise untapped reserve of not less than 3,500 gal. This can be contained in a separate tank or it may be a reserve in the roof tank supplying water to the building for general purposes, the standpipe system being connected to the bottom of the tank and the domestic supply drawn off above the 3,500 gal level. If the latter connection is run inside of the tank, brass pipe must be used, iron pipe size, and in a single length without couplings. If the system contains more than two standpipe risers, a reserve of 5,000 gal is required if the risers are served by a single tank. If divided between two tanks, there must be a reserve of 3,500 gal in each tank. The latter is the better arrangement, as it maintains some available supply, while either tank is being cleaned.

In the past, with either of these arrangements, there have been complaints, especially in buildings of residential occupancy, that the presence of these undisturbed reserves (if the tanks are not frequently cleaned) produces stagnancy to a certain extent and an unpleasant taste in the domestic supply. To overcome this, a separate tank of 3,500 or 5,000 gal capacity, as the case may be, is provided at the required elevation above the roof, into which all water is pumped directly by the house pumps. The overflow from this tank discharges into the domestic supply tank or tanks located sufficiently below to permit this water flow.

The standpipe system is connected to the bottom of the upper tank, while the domestic supply is drawn from the bottom of the lower tank or tanks, thus avoiding possible stagnancy in the latter. This arrangement also results in a saving in the cost of the tank supports, as only the smaller capacity tank has to be supported

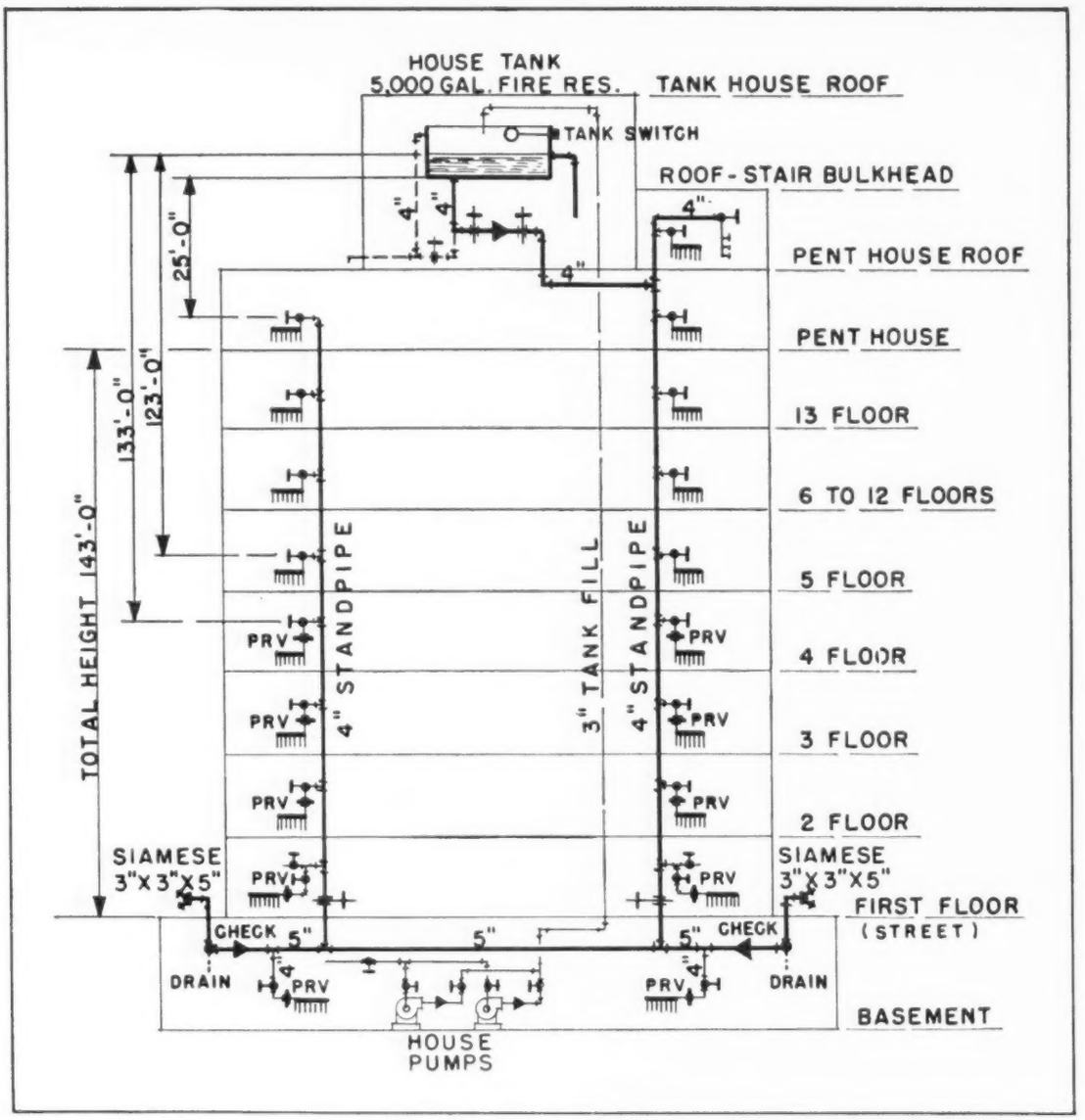


Fig. 3. Details of a double standpipe system supplied from a roof tank.

at the required 25 ft height. The larger domestic supply tanks need not be elevated to this extent.

It should also be noted that, in a standpipe system, the primary source of which is a gravity tank and which contains more than two 6-inch risers or more than four 4-inch risers, additional tank reserve capacity must be provided at the rate of 3,500 gal for each two or less additional 6-inch risers above two, and for each four or less additional 4-inch risers above four, unless a fire pump of at least 750 gpm is installed.

For supplying water to such roof tanks, whether for standpipe use only or combined use, a pump of not less than 65 gpm capacity must be installed, and a separate fill line provided. It is good practice to provide fill (house) pumps in duplicate. A tank float switch controls the operation of the pumps automatically. A fire pump, if required in the building, may not be used for this purpose, nor a standpipe as a fill line. However, in the case of low buildings, if the street or public water system is such that there is sufficient pressure *at all times during the day and on all days* to fill the tank at the required rate, the fill pump may be omitted.

Gravity tanks above roofs must be provided with drains suitable for emptying the tanks quickly and completely in an emergency, and in such a manner as not to damage the roof. Strainers must be placed at the point of discharge into risers, and suitable overflow lines provided for discharging at points close to the roof. All tanks filled by means of manually controlled pumps must have high and low water level electric alarm systems of the closed circuit type. Excepting in buildings of residential occupancy in which there is a use of water at all times, tank heaters must be installed to maintain a temperature of at least 40F at all times. Ladders must be provided for access to both the outside and inside of tanks.

It is not desirable in manipulating a 2½-inch hose to have the flowing pressure at the point of hose connection exceed 50 lb per sq in. when the discharge is at the rate of 200 gpm. Hence, when the normal hydrostatic pressure at any hose outlet exceeds 55 lb per sq in., an adjustable pressure reducer or regulator must be installed on the discharge side of the valve so that the flowing pressure on the downstream side of the pressure reducer will not exceed 50 lb per sq in.

Zoning

Furthermore, it is desirable from considerations relating to installation, maintenance and operation that the hydrostatic pressure at the lowest hose valve supplied should not exceed 150 lb per sq in. Hence,

when buildings exceed approximately 300 ft in height, the standpipe system must be divided into two or more vertical zones. Intermediate gravity tanks are then provided and located so that the bottom of the tank is at least 25 ft above the highest hose outlet in the zone directly supplied by the tank. Inasmuch as similar pressure considerations govern the domestic water supply system, an intermediate tank for supplying the latter is also provided and the installation for each zone made similar to that described. Separate fill or house pumps, preferably in duplicate, and separate fill lines, should be provided for supplying the gravity tanks of each vertical zone. These pumps must have the minimum capacity stated, but the heads against which they pump the water will, of course, be different for the different vertical zones. Such a system is shown in Fig. 4.

When standpipe systems are thus zoned vertically, certain additional requirements must be met and piping installed accordingly. In each of the upper zones, the several standpipe risers in that zone must be cross-connected at the bottom by means of a horizontal main, this main being located in the story below the lowest hose outlet of the zone or in the story below that. Generally, intermediate pipe galleries are provided below the intermediate tank rooms in which the standpipe cross-connections and the piping for other building services are run.

The cross-connecting mains at the bottom of each upper zone must be connected to the standpipe system in the zone below, horizontal check valves being so placed in these connections that it will be impossible for the water supplied from an upper zone tank to feed into the zone system below. On the other hand, all of the upper zone systems must be capable of being supplied with water pumped into the lowest zone system by the fire department through the street siamese connections. The design should be such that water can be supplied by any of the fire pumps provided for the particular zone system, as well as by the fire pumps of any of the zone systems below it.

Control valves must be also installed in the cross-connecting main of each of upper zone systems to permit isolating sections of such mains and of each standpipe riser in the corresponding zone in the event of breaks. These may be remotely controlled. Installation of the standpipe risers, sectionalizing control valves in risers, hose outlets, hose outlet pressure reducers and manifolds at tops of risers, follows the same procedure as described for the single vertical zone system, excepting that no capped hose outlet valve is required in the upper zones between the standpipe riser control valve and the lowest hose outlet in the riser.

Fire Pumps

Fire pumps are required under the following circumstances:

(1) Fire pumps may be used as a primary source of water supply in buildings not exceeding 75 ft in height, in place of gravity tank supply, provided that the total capacity of fire pumps installed is at least 750 gpm and one of the fire pumps, which serves the entire system and has a capacity of at least 250 gpm, is automatically started when any hose outlet valve is opened.

(2) In systems supplied from gravity tanks in buildings less than 250 ft in height, which have more than two 6-inch standpipe risers or more than four 4-inch standpipe risers, a manually operated fire pump of at least 750 gpm capacity may be installed instead of providing the increase in gravity tank reserve capacity mentioned.

(3) In all buildings exceeding 250 ft in height, the gravity tank supply to the standpipe systems must be supplemented by the installation of one or more fire pumps. In buildings between 250 and 450 ft in height, and equipped with not more than three standpipe risers, at least one 750 gpm fire pump or two 500 gpm fire pumps must be provided. If there are more than three standpipe risers, the total capacity of fire pumps installed must be at least 1,000 gpm. In buildings exceeding 450 ft in height at least two fire pumps, each of 750 gpm capacity, must be provided.

Under certain circumstances, when both a standpipe system and an automatic sprinkler system are installed in the same premises, the same fire pump, also located in the premises, may serve as a primary or supplementary source for both systems. Special means must be provided for limiting the pressure to which the sprinkler system is subjected.

A fire pump which is located on the ground floor of a building or below may draw its water from a header within the building, which in turn is supplied from two independent water mains in different streets. If two independent street mains are not available, a suction tank must be provided of capacity enough to furnish the fire pump or pumps with at least a half-hour's supply at their total rated capacity. Such a tank is supplied either from a separate connection from the street water main or, if both domestic and fire pump supply are taken from one tap, the connection to the domestic supply must be taken off close to the point of entry. A remotely controlled valve is placed in this line, so that it can be closed from a point near the fire pump control panel. An automatic float control valve is installed in the suction tank to control the fill pump.

The fire pump (or pumps) required for each upper zone in a zoned building is connected to draw from the intermediate gravity tank which supplies the standpipe system in the zone just below. It is generally located in a pump room on a floor below the intermediate tank and is connected to discharge into the cross-connecting main at the bottom of the standpipe zone which it serves. The connections are such, and control and check valves provided, that if any standpipe riser of its zone is isolated because of a break, the fire pump can supply the other standpipe risers of the zone. Also, by means of a by-pass connection from a standpipe riser of the zone below into the intermediate tank, water can be pumped into this intermediate tank by the fire department pumper or the fire pump in the zone below. This permits the upper zone fire pump to continue to draw water from the lower zone intermediate tank and to pump it up through the risers of the zone it serves.

To guide the operation of both fire pumps and valves, and to assist those directing the fire-fighting, a special interior telephone system must be installed. This

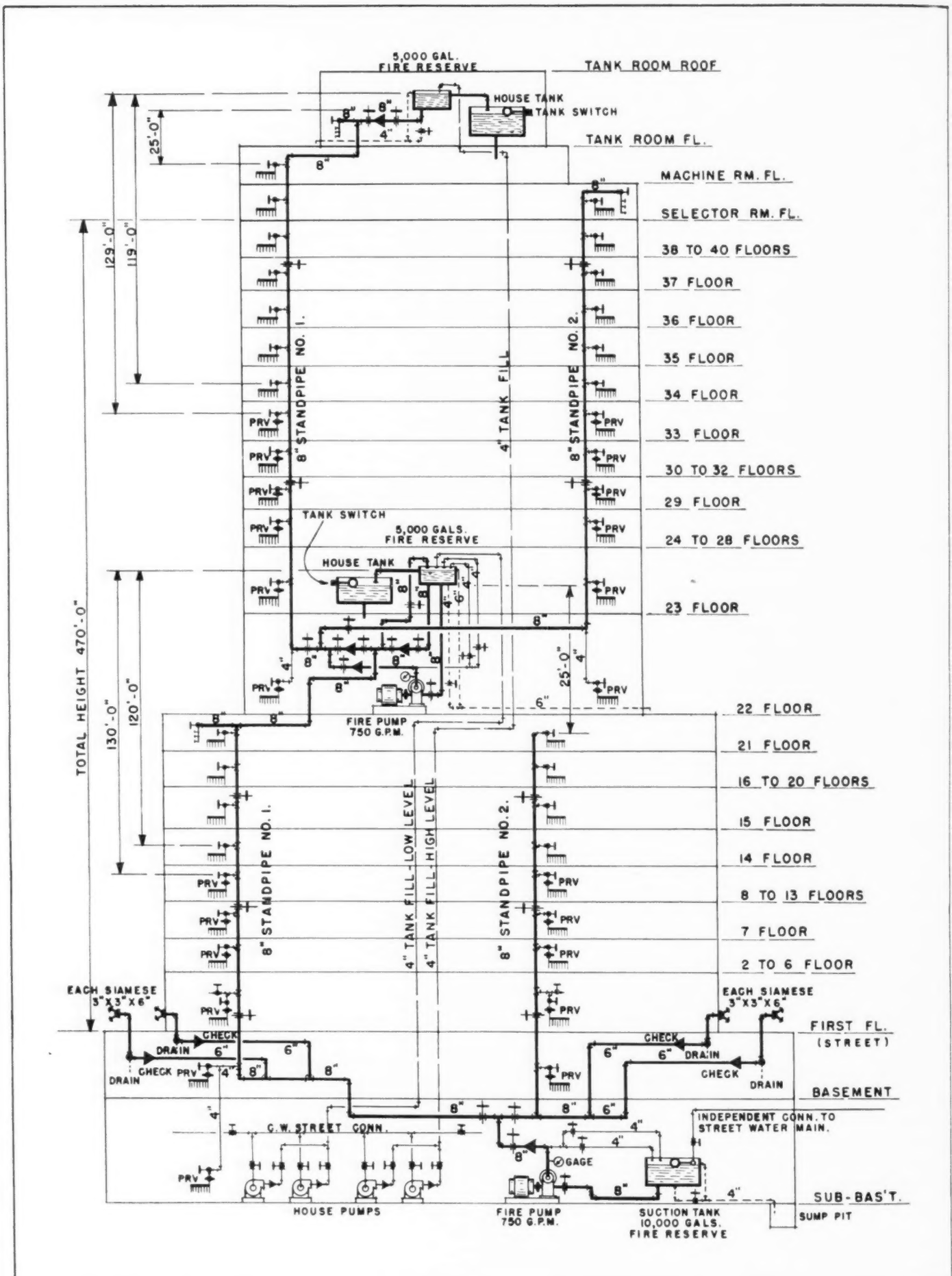
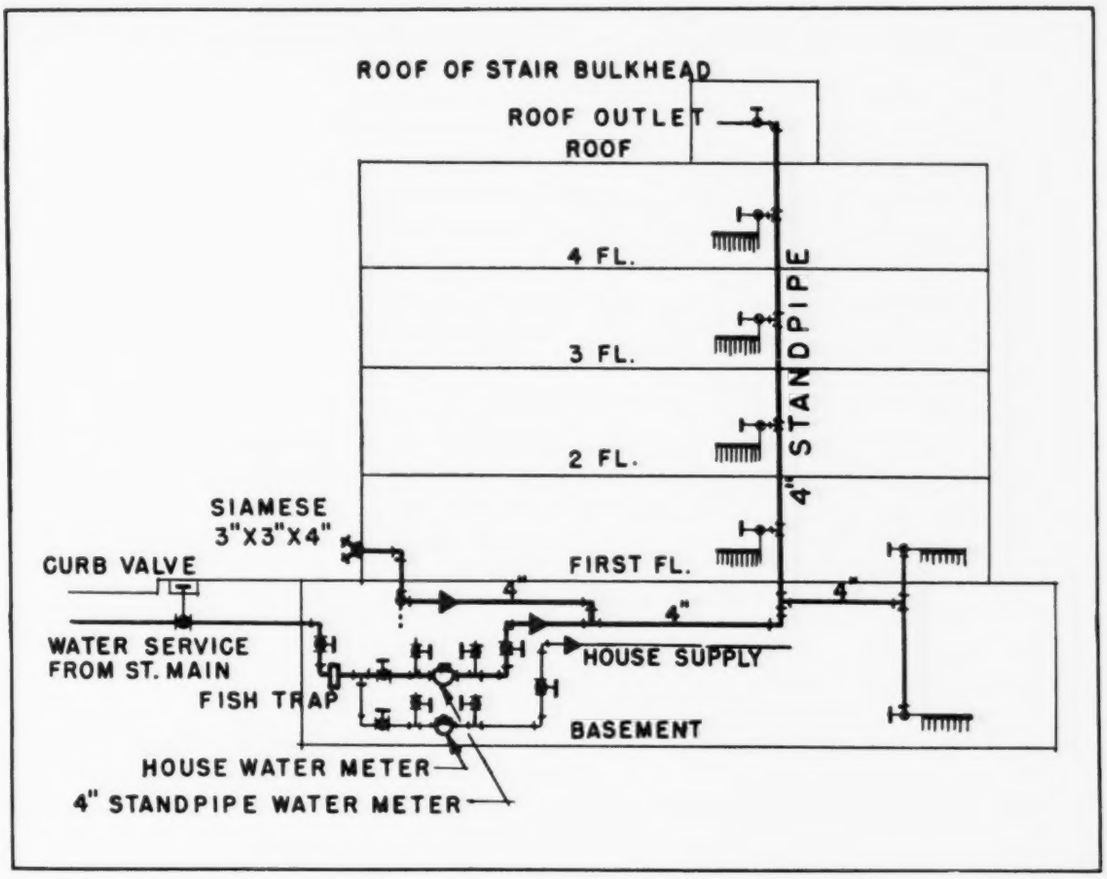


Fig. 4. Standpipe system with intermediate tanks showing connections to roof, house and fire reserve tanks, pumps, siamese connections, check valves and other valves.

Fig. 5. Arrangement of standpipe system supplied from a street main.



telephone system must permit communication between each pump room, each tank room, and points on all other floors near the standpipe risers. Permanent wall telephones, each provided with a 6-inch loud ringing gong, are installed in every pump room and tank room and also at the ground floor. At all other floors, telephone jacks enclosed in break-glass boxes are placed, or permanent wall telephones are provided, if circumstances require. If telephone jack stations are installed, several portable telephones are required to be kept in a cabinet fitted with a fire department key, in a designated location.

Other Supplies for Standpipes

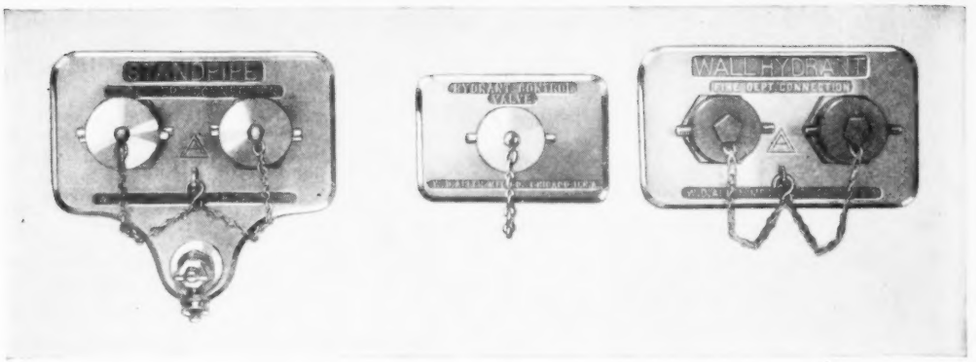
Sources of water supply, other than those previously described, are sometimes used for standpipe systems. These include (1) a direct connection to the water main in the public street; (2) pressure tanks; and (3) a private yard main. Their use may be dictated by structural, architectural or other considerations which preclude the use of elevated gravity tanks in the building.

If it can be demonstrated to the authorities by actual prescribed tests, that at all hours of the day and on all days, there is sufficient pressure in street or highway mains to maintain a minimum static pressure of 15 lb per sq in. at the highest hose outlet in the building to be supplied, a direct connection to such street main is accepted as a primary source of supply for a standpipe system. Or, in buildings 40 ft or less in height and 20,000 sq ft area, a 4-inch street connection to a street main which is fed two ways, or 4-inch connections to both of two street mains located in different streets, may be used as a primary source, provided that a minimum static pressure of 25 lb per sq in. will be maintained at all times at the highest standpipe hose outlet. The cutting-off of either street main must not interfere with the supply from the other.

When metering such connections to street mains is required or is desired, a special compound type meter is used. This consists of a full size passage containing a turbine type meter, which produces practically no loss of head when full flow is occurring during operation of the standpipe system, and a small by-pass containing a disc type meter to record the flow of small amounts of water used at other times. An automatic valve diverts the flow through the by-pass, until the flow becomes large enough to cause the automatic valve to open and thus permit the large flow through the full size passage. Such meters must be approved by the authorities. Fig. 5 shows a standpipe system in which a compound meter is installed.

One or more pressure tanks, when used as a primary source, are located at or above the level of the highest hose outlet, other than roof outlets. They must furnish the quantities of water required for gravity tanks. In the tanks, water normally occupies two-thirds of the volume, the remaining one-third being filled with air under a pressure of 70 to 80 lb per sq in. The air compressor or compressors must be capable of building up an air pressure of at least 75 lb per sq in. in the tanks within three hours. Suitable tank alarms must be provided.

Where approved yard hydrant systems are installed, supplied by elevated gravity tanks, street or highway water mains or suitable pumps, the standpipe systems within the buildings may be supplied from the mains of such a yard system. A post indicator valve must be provided in each connection of this type, located at a safe distance from the building.



Courtesy, W. D. Allen Mfg. Co.

Fig. 6 (left) Wall types of control units. Top to bottom, wall hydrant, valve control, and siamese inlet.

Fig. 7 (above) Concealed or flush type connections. Left to right, siamese with inlet, hydrant control valve, and wall hydrant.

Siamese Connections

The number and location of the siamese hose connections on the exterior of the building is governed both by the number and size of the standpipe risers and by the accessibility of the building from more than one street or highway. The last is especially important, in the event that one street may be badly congested by traffic or otherwise obstructed so as to delay the fire department in the full use of its equipment.

A system with a single standpipe, as well as those with more than one standpipe, must have at least one siamese on each street front. When more than one siamese is required on any street, they should be spaced at intervals of not more than 200 ft. If the building has continuous frontage on two or more streets, this spacing may be measured around the full perimeter. Such a building with a narrow frontage on only one of the streets, may be permitted one siamese hose connection suitably located, unless other considerations call for more. At least one siamese hose connection should be provided for a single or for each two 4-inch standpipe risers or fraction thereof, but a maximum of four siamese hose connections may be acceptable, if the number of 4-inch standpipes exceeds eight. At least one siamese hose connection should be provided for each 6-inch or larger standpipe riser. Siamese connections are illustrated in Fig. 6 and 7.

The size of the connection from each siamese to the cross-connecting main should be as previously stated. A check valve of approved type must be installed in the horizontal run of this connection within the building and as close to the siamese as possible. Provision must be made for draining the pipe between the check valve and the siamese in order to empty the section of pipe after the pumper has been disconnected from the siamese, thus preventing freeze-up and bursting of the pipe. Formerly, the pipe connection to the siamese was brought up through the sidewalk or path outside of the building, and close to the wall, but in order to eliminate sidewalk obstruction, it is now generally required to bring this pipe out through the building wall with the 2-way or 3-way capped, screwed outlets set in a wall plate finishing practically flush with the exterior face of the building wall, or set in a wall recess. These outlets must be at least 18 inches and not more than 36 inches above the sidewalk or grade.

Siamese hose connection for standpipe systems must be entirely independent of and in addition to those required for automatic sprinkler systems, or for fire pump supply. As stated, where separate standpipe systems are required in auditoriums and in the portion of a building built above an auditorium, separate siamese hose connections must be provided for each system.

In localities where sea water is used for fire-fighting and fire boats employed, siamese hose connections

Fig. 8. Soda-acid fire extinguisher, 2½-gal size.

for such systems must have outlets of such size and type, and the hose on the fire boats so sized, that the fire boats cannot be connected to standpipe systems that are either directly or indirectly connected to fresh water supply systems. This is to avoid the danger of pollution through the introduction of untreated sea water.

To insure prompt and efficient fire-fighting service, all buildings equipped with standpipe systems should be required to have at least one person, properly qualified to operate the system, always in attendance. Furthermore, in any building over 150 ft in height, an elevator must be always kept in readiness and provided with a competent operator, so that in the event of fire, he can assist fire fighters to reach any part of the building as quickly as possible.

Since fires can and do originate in buildings while under construction, a standpipe system with hose outlets, hose and street siamese hose connections must be available when the floor construction has progressed to a height 75 ft above grade or above the seventh story. This standpipe system may be the permanent system, or a system specially installed for temporary use during the construction period. The number of standpipes in either case should be as many as are required for the permanent system. The standpipe, whether temporary or permanent, must be extended upward to keep pace with the erection of the structure, and the top always capped so that water will not be discharged from the standpipe when the fire department pumpers are at work. When construction has reached a height of 150 ft, at least one elevator with a competent operator should be available at all times for use by the fire department.

Appendix—Portable Fire Extinguishers

Portable extinguishers are perhaps the simplest type of fire extinguishing apparatus and are applicable to every type of building from the tallest structure to the smallest shed. Earlier types, still widely used, are pails filled with water or with sand. The latter is effective when small amounts of flammable liquids or greases are spilled on floors. Receptacles or bins filled with a mixture of soda and sawdust, which is removed by means of scoops, are sometimes provided for use in such cases.

There are several types of portable hand-operated extinguishers of the chemical solution type. One of these in general use is the soda-acid extinguisher, which contains a dilute solution of sodium bicarbonate in the shell and a bottle filled with sulfuric acid in an upright position near the top. When removed from its support and inverted, the acid flows into the solution producing water and carbon dioxide. The carbon dioxide, when carried out through a nozzle at the end of a flexible tube, mixes with the surrounding air and

Fig. 8, 9 and 10, courtesy American-La France-Foamite Corp.

Fig. 9. A few of the available models of carbon dioxide portable extinguishers.

Fig. 10. Single soda-acid type fire extinguisher mounted on a two-wheel chassis.

hinders or stops combustion. This extinguisher, which is usually used in the 2½-gallon size, is the most common type. See Fig. 8.

Another portable hand-operated extinguisher of the chemical type is generally termed a carbon tetrachloride extinguisher, containing a non-conducting liquid having a carbon tetrachloride base with low freezing point. A stream of this solution directed close to the fire is vaporized by the heat of the fire. The vapor that is generated blankets the burning material. This type is generally used on burning electrical equipment as the vapor and liquid are non-conducting. However, precautions must be taken when used in confined spaces. For domestic use, and where the extinguisher is handled by women, a 1- or 1¼-quart size is used.

The foam extinguisher, which is coming into wider use, is another portable hand-operated extinguisher. The outer can contains a solution of bicarbonate of soda and licorice extract or other foam-stabilizing agent. A long cylinder filled with a solution of aluminum sulfate or alum is located near the top. When the extinguisher is inverted, carbon dioxide is given off which, mixing with the liquid, is discharged through a nozzle attached to a flexible tube, emerging as a heavy foam with tough-skinned bubbles. The foam clings to the burning material and renders it non-combustible. These extinguishers are applicable to open vessels filled with flammable liquids and greases where the foam envelope will not be objectionable. They are not recommended for use on electrical equipment. In industrial establishments, sizes up to 5 gallons are used.

There is also a portable hand-operated extinguisher, filled with plain water containing a suitable anti-freeze component, for use in unheated spaces. Dry chemical extinguishers are also available.

The carbon dioxide portable hand-operated extinguisher contains carbon dioxide in liquid form stored under high pressure. Upon opening a valve, the liquid gasifies and is discharged by its own pressure through a suitable tubing with a nozzle at the end, to create an atmosphere which will not support combustion. This extinguisher offers the advantage of not wetting or coating the burning material, apparatus, or surrounding objects. It is therefore suitable for fires developing in electrical equipment. It is not so effective in the case of deep-seated fires in piles of rubbish and materials where a cooling effect is required to extinguish the fire completely. Several types are shown in Fig. 9.

The number and location of hand-operated extinguishers will be determined by the nature of the occupancy and the arrangement of the building. Government and insurance codes should be followed. Needless to say they should be located so as to be easily accessible, kept so at all times, and protected against freezing.

Portable fire extinguishers, being necessarily limited in bulk and weight, provide a comparatively small amount of extinguishing material and hence are operative for only short periods of time. Therefore, in many cases, especially in industrial plants and warehouses, mobile or wheeled units are used. These consist of larger size single tanks, Fig. 10, or multiple tanks mounted on a wheeled truck or carriage, with a handle-bar for propelling and steering. All of the portable extinguishers described are available in the wheeled type.

Damper Switches Improve Control of Dust During Grinding

LESLIE SILVERMAN
Associate Professor of Industrial Hygiene, Harvard University, School of Public Health

THE writer recently had an opportunity to study dust control on grinding operations where wheel use is sporadic. Requirements were of such a nature that while a series of wheels were used intermittently, effective air volumes were necessary for each wheel during grinding.

Measurements indicated that the installed ventilation for each wheel was inadequate, and the total air flow

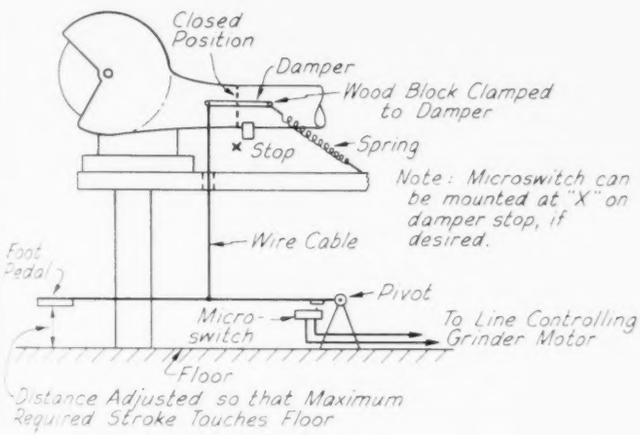


Fig. 1. Arrangement of damper control for abrasive tool grinding.

for wheels of different widths and shapes was inadequate to meet requirements recommended by various state and code authorities. The number of wheels used at any one time was limited and if the volume available were applied, effective control would result.

It is not considered desirable practice in local exhaust design to install dampers or blast gates, particularly where they can be manipulated by operators. The reasoning for this objection is sound because it places a burden on maintenance to check dampers and in systems where a heavy dust loading exists, they create obstruction and interference with proper control. Dampers should not ordinarily be placed in a dust conveying system as a means of correcting faulty design or balance.

In the situation encountered, however, the dust loadings were light. The amount of dust created by daily tool grinding was not excessive and dampers were already installed. These dampers were not being used effectively, since the men were not paying adequate attention to their setting and they were not closing each wheel damper at the end of grinding operations.

It was found possible to restore effective control with the previously installed dampers by means of the simple device shown in Fig. 1. In this apparatus, the damper handle, shown in detail in Fig. 2, is connected by means of a microswitch arrangement adjusted so that the wheel cannot be operated unless the foot pedal is depressed. When this is done, the microswitch closes and the damper is wide open. It will be noted that, as designed, the switch cannot be closed to operate the grinding wheel unless the exhaust pipe damper opens. However, when the foot pedal is released, the grinding wheel shuts off and the damper closes completely, independently of any operation by the worker. It is only necessary for the worker to keep the foot pedal depressed during the grinding.

This mechanical arrangement is simpler and more economical than where an attempt is made to use a solenoid-controlled switch operated by turning the damper which would then operate the grinding wheel power switch. In this particular case, all grinding wheels were mounted on individual motor units. If the wheels are driven from a countershaft and belt system, the damper can be operated by the belt shift arm through some type of lever system. The microswitches should be of adequate capacity to carry the motor current rating and should not be accessible in order to prevent jamming or tampering.

The arrangement provides effective individual wheel control without changes in air volumes and piping. It is suggested, as a possible substitute, where installation of a new fan and motor system may be uneconomical.

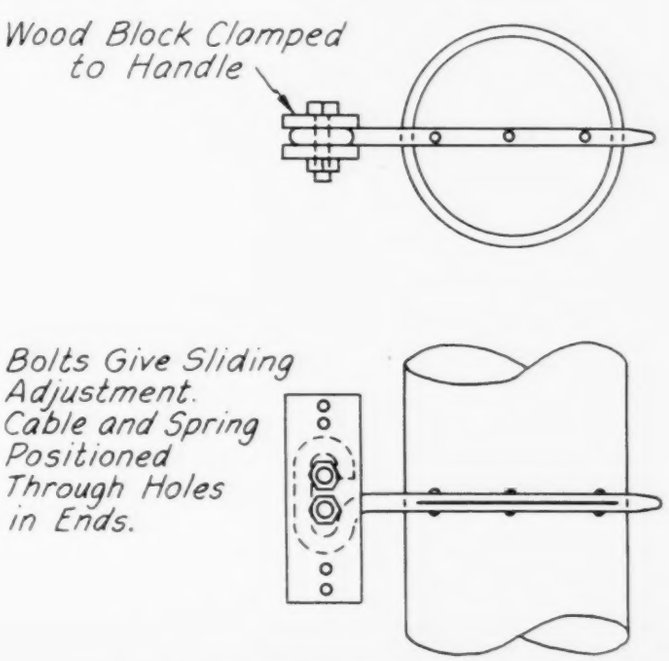


Fig. 2. Detail of the damper.

A Graphical Method for Estimating

Fuel Consumption for Heating

GEORGE P. JANKAUSKAS
Office of V. L. Falotico & Associates, Consulting Engineers
Brooklyn, N. Y.

To determine fuel consumption for space heating over any period, all that is required is to know the installed heating capacity or heat loss at design conditions and the number of degree-days occurring over the period.

THE installed capacity of a heating plant is based on design conditions, including an outside design temperature set low enough to handle maximum probable demand. Fuel consumption in the plant, on the other hand, is a function of actual outside conditions which may vary hourly. A useful criterion of actual outside conditions over a given period, such as a month or a season, is the number of degree-days which occur during the period. Hence, a fuel estimating method may be based on relating degree-days to installed capacity.

Neglecting basement losses, the heat loss of a building at design conditions can be expressed as

$$H = (t_i - t_o)\ (Q + V) \qquad (1)$$

Where H is building heat loss in Btu per hour at outside design temperature, t_o, with inside at t_i; Q is transmission loss per degree and V is ventilation loss per degree temperature difference calculated in the usual manner. Note that H determines the installed capacity of the system.

The total heat loss per hour per degree temperature difference is, therefore, $H/(t_i - t_o)$ Btu per (hr) (F).

The heat loss in an assumed period will be:

(hourly heat loss per deg. F) $\times$ (24 hr per day) $\times$ (degree-days per period) or $L = \dfrac{24\ H\ D}{(t_i - t_o)}$ (2)

Where L = total heat loss, Btu per period
D = degree-days per period

Fuel consumption will be

$$F = \frac{L}{CE} = \frac{24\ H\ D}{CE\ (t_i - t_o)} \qquad (3)$$

Where C = fuel calorific value
E = boiler efficiency coefficient

With proper attention to units in F and C, Equation 3 can be applied to any heating system using any fuel.

If heating capacity H is expressed in thousands of Btu per hour as B, and an average calorific value for fuel oil is assumed to be 144,000 Btu per gal, and inside design temperature is assumed to be 70F, fuel oil consumption will be:

$$F = \frac{(24)\ (B)\ (D)}{(144)\ (70 - t_o)} = \frac{(.167)\ (B)\ (D)}{(70 - t_o)} \qquad (4$$

gallons per period.

This equation can be plotted graphically in straigh lines on a logarithmic scale, as shown by:

log F = log .167 + log B + log D — log (70 — t_o

A graphical solution is shown in Fig. 1. The grap can be extended in every direction by applying ade quate scales.

Example

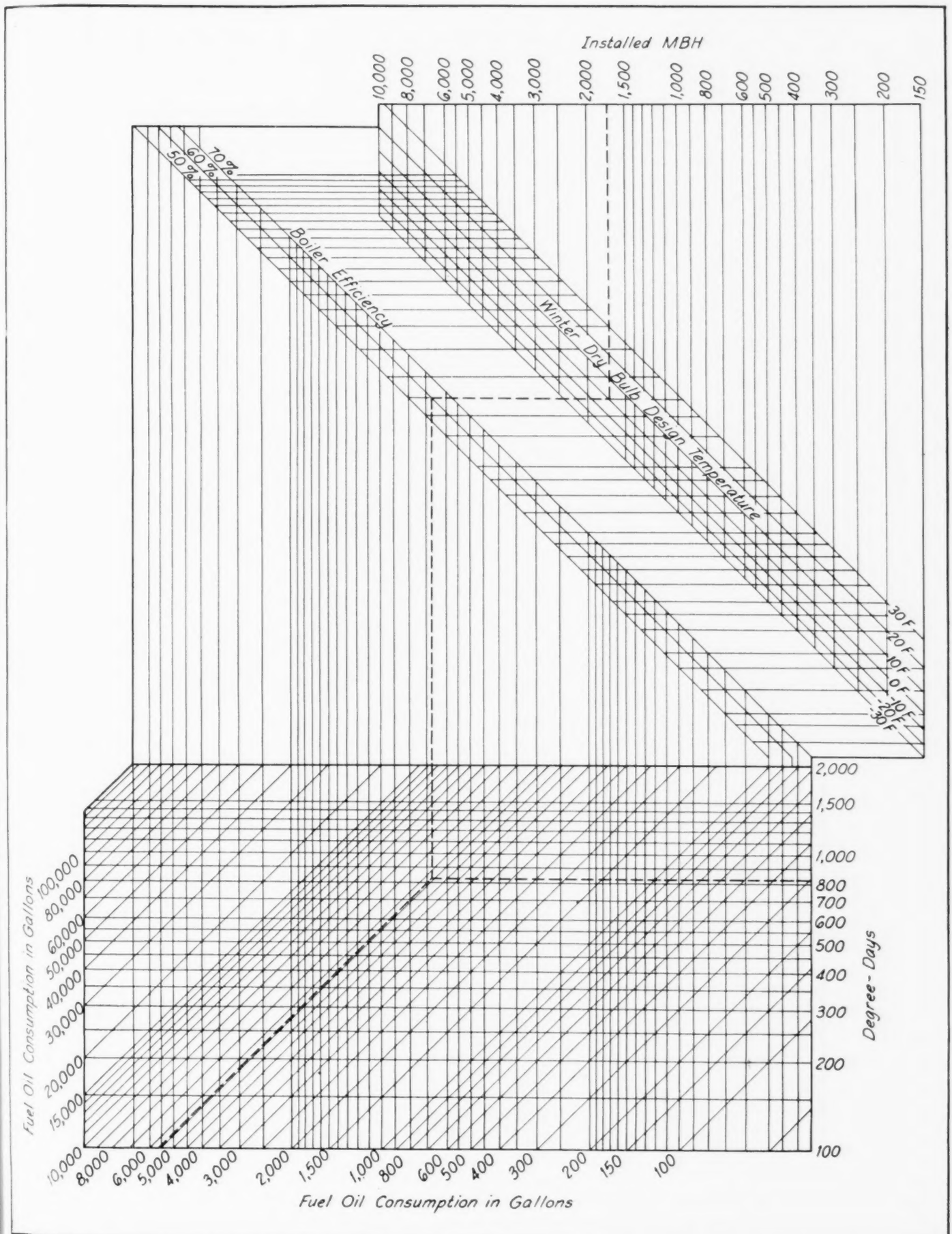
A fuel oil tank is to be sized on the basis of month's supply of oil in a building located in Lynch burg, Va., having 1,700 installed MBH and operatin at 60% efficiency. The outside winter design tem perature for Lynchburg is 0F, and the coldest mont is January, with a normal of 829 degree-days.

Solution: Enter the top of the chart at 1,700 MBH and descend vertically to the 0F design temperatur line. Proceed horizontally from this intersection t the 60% boiler efficiency line and hence descend ver tically to the horizontal for 829 degree-days in th lower section of the chart. The fuel oil consumptio diagonal at this point is for 5,600 gal, and the tan must be of at least that capacity to hold a *norm* January supply of oil for this plant. The dotted line in Fig. 1 follow the solution of this particular exampl

Paradox

Note that in a milder climate the fuel consumptio will be larger for the same installed heating capacit and the same *number* of degree days (not the sam period). The explanation of this seeming paradox apparent in the expression $H/(t_i - t_o)$ for hourl heat loss per degree temperature difference. In milde climates, t_o will be higher and therefore the value the fraction will be larger (it will have a smalle denominator). The same reasoning applies to Equa tions 2, 3, and 4. In other words, for the same in stalled heating capacity, a building in a mild clima will be larger than a building in a colder climate.

Another seeming paradox is that, in Equations and 4, as t_o approaches t_i, the fuel consumptio appears to go to infinity, since $t_i - t_o$ would be zer The explanation is in Equation 1 and 4, which sho that at that point H, B and D would also be zero an no fuel would be consumed.



Fuel estimating chart. Example shown by dotted line is for fuel oil at 144,000 Btu per gal. For other fuels multiply consumption in gallons by 144,000 and divide by caloric content of other fuel. MBH = thousands of Btu per hour.

Heat Transmission of

Lightweight Aggregate Concretes

WM. B. FOXHALL
Associate Editor, Heating and Ventilating

Physical, structural, and working characteristics of concretes made with various lightweight aggregates were studied by cooperating government agencies. Following is a discussion of thermal conductivity based on findings set forth in the full report.[1]

IN general, the lighter the concrete made with lightweight aggregates, the lower is its conductivity. This is by no means a straight line relationship for all aggregates, but is practically so for any given aggregate over the range of concrete densities usually used.

These general conclusions can be drawn from data presented in a report prepared by Perry H. Peterson of the Division of Standardized Building Codes and Materials and released by HHFA. Laboratory work forming the basis of the report was performed under the Standardized Building Codes and Materials program of HHFA under agreement with the National Bureau of Standards and the Bureau of Reclamation.

The investigation covered by the report was confined to aggregates of mineral origin.

Samples of all readily obtainable types were tested. Variations in characteristics within types were noted and attributed to various mining, grading, and manufacturing conditions.

Both laboratories developed data on the following physical properties of the concretes made: (1) Weight per cubic foot of concrete; (2) compressive and transverse strength; (3) shrinkage; (4) thermal conductivity; (5) absorption; (6) modulus of elasticity; (7) resistance to freezing. This abstract deals only with thermal conductivity.

Thermal Conductivities

A plot of the original data shows that thermal conductivity of concretes made with a given lightweight aggregate increases with the oven-dry density of the concrete in about a straight line relationship over the range of densities tested. Fig. 1 shows this linear variation of k with density and is a representative example of the scattering of observed data for mixes of one aggregate; pumice in this case. The curves in Fig. 2 cover the approximate range of densities tested.

[1] *Lightweight Aggregate Concretes*, issued by Housing and Home Finance Agency, Division of Standardized Building Codes and Materials. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price, 20 cents.

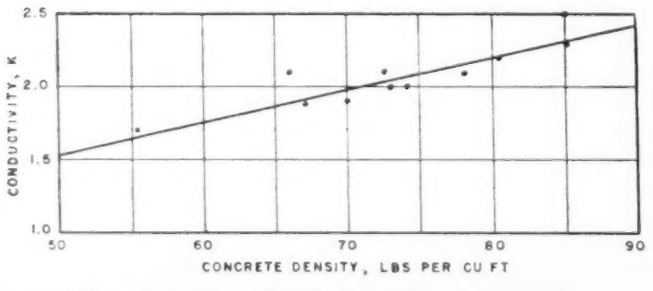


Fig. 1. Scatter of data for pumice aggregate.

TABLE 1—HEAT TRANSMISSION COEFFICIENTS OF POURED WALLS OF CONCRETE MADE WITH VARIOUS LIGHTWEIGHT AGGREGATES

Aggregate	Oven-Dry Density, lb/cu ft	k, (Btu) (in.)/(sq ft) (hr) (F)	Wall Thickness, Inches					
			4	6	10	12	16	18
			U Values, Btu/(sq ft) (hr) (F)					
Vermiculite								
	27	.93	.197	.139	.087	.074	.056	.050
	40	1.30	.259	.185	.118	.100	.076	.069
	60	1.90	.346	.253	.165	.139	.108	.096
Perlite								
	25	.80	.173	.121	.075	.063	.048	.043
	40	1.25	.252	.179	.114	.096	.073	.066
	60	1.80	.332	.243	.157	.134	.102	.092
Expanded Clay								
	50	1.3	.259	.185	.118	.100	.076	.069
	75	2.8	.453	.341	.228	.197	.179	.138
	90	3.6	.527	.408	.280	.240	.190	.170
	100	4.2	.578	.452	.315	.274	.217	.196
Pumice								
	55	1.6	.306	.221	.141	.121	.093	.083
	70	1.9	.348	.255	.165	.141	.109	.097
	85	2.3	.398	.296	.193	.167	.129	.117
Expanded Slag								
	60	1.5	.292	.210	.134	.114	.088	.078
	80	2.3	.398	.296	.193	.167	.129	.117
	100	3.1	.485	.370	.252	.214	.167	.152
Scoria (Lava Cinders)								
	68	1.7	.320	.233	.150	.129	.098	.089
	75	1.9	.348	.254	.165	.141	.109	.097
	95	2.4	.411	.306	.201	.173	.136	.121
Sintered Fly Ash								
	80	2.4	.411	.306	.201	.173	.136	.121
	90	3.0	.475	.361	.246	.210	.165	.150
Diatomaceous Earth								
	41	1.2	.244	.176	.110	.093	.071	.063
	54	1.5	.292	.210	.134	.114	.088	.078

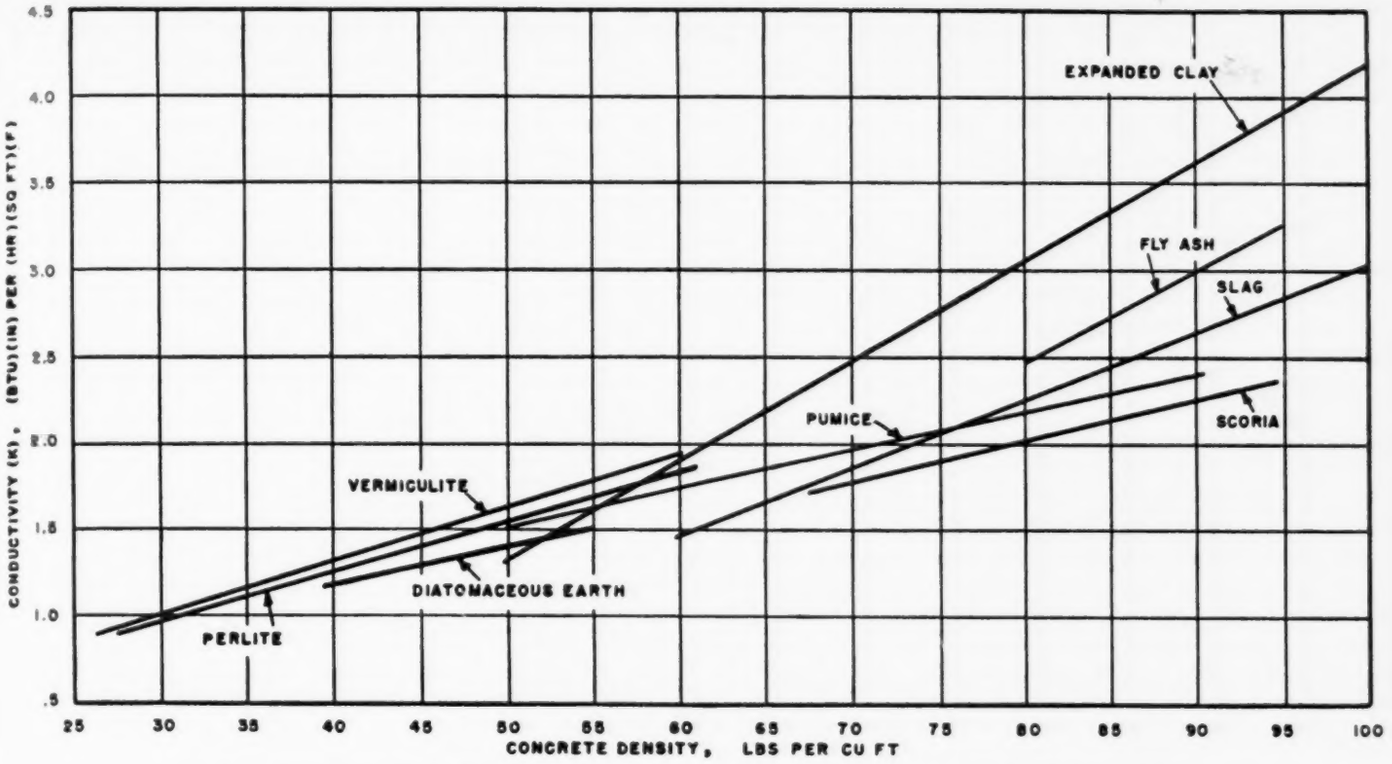


Fig. 2. Variation of conductivity with density of concretes made with various aggregates.

These curves should not be extrapolated too far, since density is a function of mix proportions and air entrainment and, of course, would approach a value for pure cement as an upper limit, as would the value for k.

Values of k from Fig. 2 were used to calculate heat transmission coefficients (U values) of various walls as shown in Table 1. Standard inside and outside film coefficients of 1.65 and 6.0, respectively, were used in these calculations.

Operation of Window Air Conditioners

In a discussion of window unit air conditioners for medical and dental offices, W. F. Switzer, commercial sales manager, Frigidaire Division of General Motors Corp., presents mechanical and operating data on that type of unit.

Window unit air conditioners are produced in several sizes, the most popular being one-half and one horsepower models. One of the larger one horsepower models is equipped with two one-half horsepower compressors which operate together or separately, depending upon demand of the load. Priced at about $100 more than a one-half horsepower room air conditioner, generally speaking, this unit will serve a room with as much as 400 sq ft floor area. The one-half horsepower units will serve rooms up to about 200 sq ft.

Another important factor to analyze in the selection of air conditioners is seasonal operating costs. One of the factors determining operating cost is the length of the warm-weather season translated into operating hours. In extreme northern portions of the country, including upper Maine, Michigan, North Dakota, Montana and the state of Washington, operating time of air conditioners will range from 300 to 500 hours.

It has been estimated that operating time for the New England states, upper Ohio, Indiana, Kansas, Colorado, Utah, Nevada and California range from 500 to 800 hours. Another band of states across the country, including most of North Carolina, Tennessee, northern Arkansas, Oklahoma, Texas, New Mexico, Arizona, most of Nevada and central California have warm-weather seasons calling for operating time of about 800 to 1,200 hours. Operating hours range from about 1,200 to 1,600 in South Carolina, Georgia, Alabama, southern Oklahoma, central Texas, New Mexico, Arizona and southern California. More than 1,600 hours of operating time are recorded for southern sections of Texas and Florida.

Computed on the basis of two cents for each kilowatt hour, a one-half horsepower window air conditioner would operate 1,000 hours for about $12 or $13.

A study by Frigidaire for one-half horsepower and one horsepower window air conditioners shows the following operating costs with current at two cents per kilowatt hour:

	½ hp Air Conditioner			1 hp Air Conditioner		
	Outdoor Temperature, F					
	90	95	100	90	95	100
	Watts Consumed Per Hour					
Hours	640	670	695	1070	1120	1160
1000	$12.80	$13.40	$13.90	$21.40	$22.40	$23.20
800	$10.24	$10.72	$11.12	$17.12	$17.92	$18.56
600	$ 7.68	$ 8.04	$ 8.34	$12.84	$13.44	$13.92

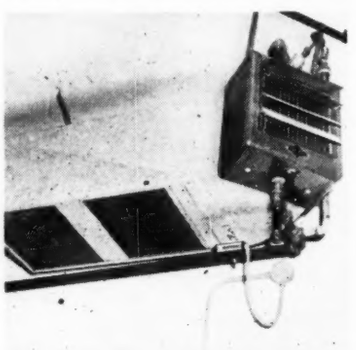
PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Air Filters Cut Unit Heater Maintenance Costs

PROBLEM: To prevent high costs of unit heater maintenance due to infiltration of dirt and dust in working parts.

SOLUTION: A sheet metal box, which was built to hold air filters, was positioned directly behind the unit heater. In operation, as the unit heater draws in air to be heated and recirculated, the air passes through the air filters and is thoroughly cleaned. Thus, only clean air is permitted to flow through the unit heater, and the heater parts are kept free from dust and dirt. Filters are by Research Products Corp.



RESULT: In addition to the advantage of circulating clean air throughout the heated area, the efficiency of the heater is maintained at a maximum and costly repair because of excessive wear is eliminated. The necessity for dismantling and taking down the heater is avoided, and the only cost is the comparatively minor expense of filter replacement.

Item P101

Leak Detector Speeds Milk Tank Manufacture

PROBLEM: Detecting leakage in stainless steel refrigerated milk storage equipment required bulky hydraulic pressure systems and considerable time at McHale Manufacturing Co. of Los Angeles. If refrigerant escapes from system into tanks while in use, the entire contents of the tank, up to 15,000 gallons of milk, would be spoiled.

SOLUTION: A General Electric Type H leak detector was installed. By introducing a small amount of carbon tetrachloride into the refrigerating system, leaks can be located by passing the barrel of a leak detector gun along the welds. The indicator on a control unit shows up even minute leaks instantly.

RESULT: Simplification of testing procedure cut costs in tank manufacture. Sensitivity of instrument resulted in more reliable tests.

Item P102

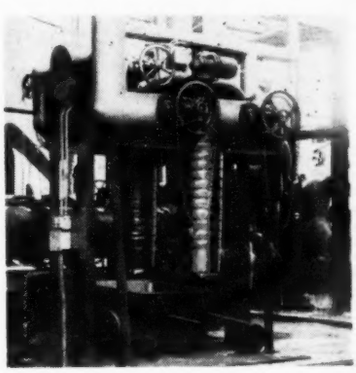
WANT MORE INFORMATION?

If so, just use the prepaid postcard opposite page 96. Write in the item numbers covering products in which you are interested. Sources will be asked to send particulars promptly.

Scraper-Strainer Prevents Burner Clogging

PROBLEM: Carbon and coke clogged burner nozzles at the Hunter's Point Gas Works of Consolidated Edison Company of New York where tar is used as fuel.

SOLUTION: Sarco scraper-strainers with special screens were fitted in tar lines to burners. These strainers are similar to ordinary pipe strainers but a helically shaped knife is snugly fitted to the inside surface of the screen. This knife or scraper can be rotated by hand or motor to remove clogging foreign matter from the inside of the screen. The foreign matter drops into a container below the strainers where it can be removed periodically.



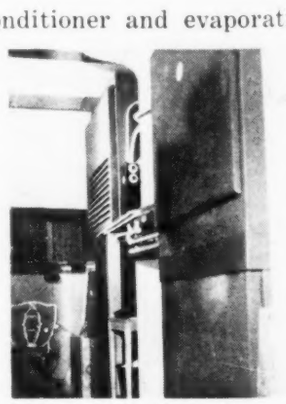
RESULT: Burners are able to operate continuously without shutting down to clean strainers.

Item P103

Evaporative Condenser Uses No Floor Space

PROBLEM: To install small packaged air conditioning unit and evaporative condenser with minimum use of floor space.

SOLUTION: A 3-ton air conditioner and evaporative condenser were installed by Kooleraire Conditioning Co., of Manhattan, in the office of the Cabana Beachwear Company, 1410 Broadway, New York City. Office floor space was insufficient since file space was essential to office operation. Typhoon evaporative condenser, which is manufactured in the same



width and depth as 3-ton conditioner, was placed on top of high side, and low side set on shelf above file. Simple metal collar joins evaporative condenser and high side into single packaged unit Standard air conditioner comes in two attached sections, making this split possible.

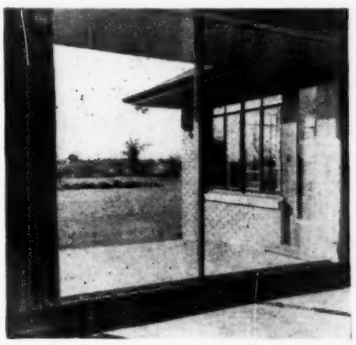
RESULT: Evaporative condenser and high side make single packaged unit; low side on shelf allows ample space for office filing equipment.

Item P104

Sill Grilles Stop Window Drafts

PROBLEM: Floor drafts frequently result from installation of large glass areas such as are encountered in picture windows or display windows.

SOLUTION: Barber-Colman warm air supply grilles installed in window sills, with outlet guides deflecting about 5 degrees away from the window and toward the ceiling, offset the effects of the curtain of cold air normally descending on the surface of the window. Uniform flow across the outlet is produced by a multiple blade damper. Returns are placed at the foot of the opposite wall. A laboratory mock-up of each installation assures air distribution unimpeded by curtains or corners around windows.



RESULT: Cold air from the window is prevented from descending to the floor and is picked up and mixed with warm air from the grille. In summer, window sill grilles permit greater temperature differential between supply and room air.

Item P105

Insulation Stops Roof Drain Condensation

PROBLEM: To prevent water from condensing on roof drain pipes enclosed in walls at St. Vincent's Hospital, Toledo.

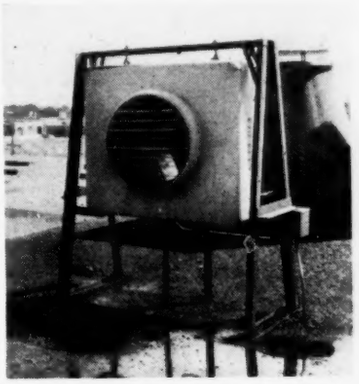
SOLUTION: Four layers of Fiberglas Aerocor insulation, a thickness of two inches, are wrapped around the pipe and bound with Fiberglas tape. Insulation and tape are impervious to moisture and may be enclosed in walls without danger of rotting.

RESULTS: Condensation of pipes is prevented. Walls are protected against deterioration by moisture from pipes.

Item P106

Unit Heater for Summer Only

PROBLEM: The burning of packing waste at the Binswanger Co., Richmond, Va., dealers in glass, generated steam the year around. In summer, only part of the steam could be used in the mirror-plating equipment. Excess steam in summer was released in objectionable amounts through safety valves.



SOLUTION: A Modine Power Throw unit heater mounted on the roof is used in summer only and is fitted with a pressure switch to turn the unit on when excess steam has accumulated. Heater condenses the steam and returns condensate while excess heat is discharged to the atmosphere.

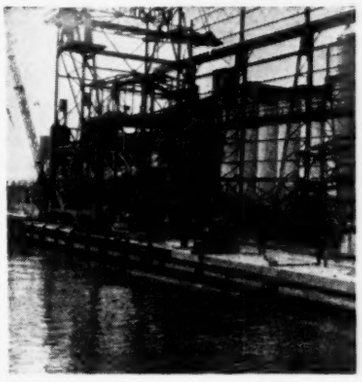
RESULT: No more objectionable steam in the boiler room. No more wasting of boiler water in exhaust steam.

Item P107

Steam-Oil Conduit Solves Flow Problem

PROBLEM: To run both steam and oil through outside lines where oil viscosity in winter is too high for pumping.

SOLUTION: Both oil and steam lines are contained within a single conduit at a plant of the National Gypsum Co. Ric-wiL Hel-coR prefabricated conduit was installed under piers, parallel and under railroad tracks, and through filled ground. Line in winter is exposed to cold tide water and cold air, while steam furnishes heat for various buildings and also maintains the oil line temperature at 200F.



RESULT: Oil temperature permits easy circulation. Common conduit simplifies distribution of process liquids and steam.

Item P108

HEATING AND VENTILATING will pay for acceptable Product Application stories of new, unusual, or ingenious uses of equipment or materials sent to this magazine exclusively. Items should be about the length of those in this month's issue and should be illustrated if possible. Payment is on publication. Send to Editor, Heating and Ventilating, 148 Lafayette Street, New York 13, N. Y.

Experience is my Classroom

By T. W. REYNOLDS

CHANGING FROM SOFT TO HARD COAL USE

During the recent coal strike, local and long distance calls were received from clients who wanted to know if and how they can substitute hard coal for soft. Some said they have hand-fired boilers, others stoker-fired. In most cases they did not know what they had, or the make and type of stoker. In view of this abundance of no-information, the following was prepared as a generalized emergency guide. Even though the coal strike is now settled the question of substituting hard coal for soft coal comes up every once in awhile. Coal strikes go, only to come again, so the comments should be in order.

One lesson to learn is what to do about these things in the future. Obviously, one can convert to combination pulverized coal and oil burners, and even throw in gas for good measure. For the user who is wedded to coal, there should be a stoker convertible from soft to hard coal, or vice versa. Only a few such stokers are made to date—just one or two to my knowledge. For example, one make of bituminous underfeed continuous stoker can be converted overnight by an expenditure of $100 for side grates, feeder worm and retort blocks. Some users buy these stokers, together with conversion parts, and store the parts for emergency use.

For hand-fired boilers, the solution to the problem is not difficult, provided the boiler capacity is sufficiently in excess to offset the loss of about 15% in efficiency which follows with the substitution of hard coal. Or this reduction of capacity, in any event, may not be serious to production in many cases. Such reduction may be lessened somewhat by the amount of bituminous coal mixed with the anthracite—usually at least 10% is required.

Hard coal burns to a greater amount of ash and requires more draft. Therefore, a blower must be installed on hand-fired jobs where the draft is none too good. Since hard coal has but 10,000-11,500 Btu per lb compared with the 13,000-14,000 Btu of soft coal, more hard coal must be burned for the same amount of heat. These values are not considered unusual by the well-informed user of coals.

So the differences in heat values, efficiency, rate of burning without clinker, density or thickness of fuel bed and draft requirements, in reality call for more grate with hard coal. Actually, one does the best with the grate he has and much depends upon the fireman and the percentage of soft coal mix to prevent clinkering. More or less hard coal will be lost through the grates, dependent upon the thickness of ash maintained, but grates with 5/16 inch opening will take care of most fuels with but normal loss to the ash pit.

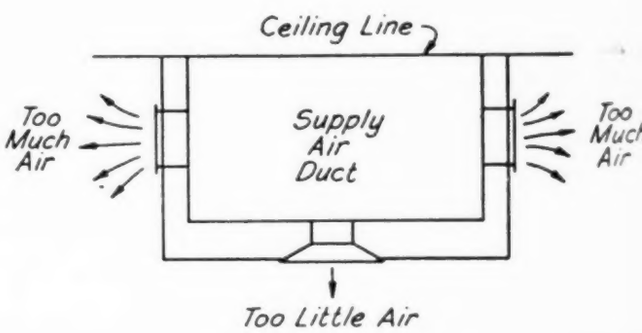
The traveling grate stoker is better adapted for anthracite use; the underfeed stoker for bituminous use. Anthracite used in an underfeed stoker will reduce boiler capacity. Ash builds up and clinkers form over the retort to stop the passage of air. The fuel does not distribute well, and the clinkering requires hourly attention. However, after a fashion, and dependent upon the time and skill of the attendant, one can get along fairly well, provided he mixes two or three parts of bituminous with one of anthracite. This, however, gives but a small amount of substitution.

If one can get along with a considerable reduction in boiler capacity, he can even hand-fire a stoker with all anthracite coal. A thin cover of ash must be built up, and firing doors must be available.

A word about efficiencies of various fuels—a mooted point. In the writer's experience, while real efficiencies are obtainable with bituminous coal, they are not achieved by the average attendant. There is also the tendency of soft coal to smoke. Thermal value comparisons of the two fuels are most favorable to soft coal. Although more heat units can be bought for the dollar, heat values and prices vary from place to place and from day to day, and are not always the same at a given time even in the same place or nearby locality. Generalities are no good and each case must be analyzed on its own.

RESISTANCE OF UNLIKE OUTLETS

The accompanying sketch illustrates a condition which is quite likely to give results different than



Resistance of Unlike Outlets.

Note: Mr. Reynolds is Chief, Air Conditioning Division, Abbott, Merkt & Co., Engineers, New York.

anticipated, due to a considerable difference in resistance between that of the grille and the ceiling outlet shown, the last mentioned having much the higher resistance. This difference in resistance in combination is not generally appreciated.

In the lunchroom installation illustrated, the trouble was further magnified by the additional factor of too much air being calculated for the grilles. The amount of grille air was determined on the basis of a large exterior glass area; customers seating occupancy along this glass which customers must be kept cool, otherwise there might be employes and no customers.

It so happened that the greatest heat gain was under the ceiling outlet where both the long term employes and the heat producing apparatus are located, so soon there were customers and no employes, a statement slightly exaggerated, but nevertheless true.

COOLING PAYS FOR ITSELF

An air conditioning system but recently installed for a goodly portion of a skyscraper floor in New York City cost $40,000 in place, or $4,000 per year, considering the total cost will be amortized in ten years. The chief executive of the place, however, has a new and different slant as to cost. Says the cost is nothing; in fact the air conditioning system actually saves him money. He figures to save at least one per cent of his employes' time (48 minutes per day), which, for 100 employes each averaging $4,000 per year salary, fully offsets in 10 years the original cost of the air conditioning system.

This man says he notices that the employes, as a general rule, now arrive at the office earlier, then start to work sooner, and spend less time for lunch in restaurants, even where these are air conditioned. He discovers that they take less trips to the water cooler, fool around less, think more clearly, and find fewer excuses for going home early. Of course, there is less absenteeism for sickness and other reasons, dust is hardly noticeable, and there is less employe turnover, due to the more satisfactory working conditions.

Formerly the opened window was depended upon for ventilation, requiring frequent operation of windows to prevent gusts of wind or the entrance of rain. Window operation, he found, was a constant source of annoyance and the cause of argument among employes, and this, together with dusting operations, weather discussions, and early office closing during abnormally hot weather, consumed altogether a surprising amount of time. Weather and its regulation fully removed from the mind and attention of numerous employes is most certainly a logical step.

OVERLOOKED WATER SAVINGS

The existing water shortage in New York City and some other cities has served to highlight what has been the trend for some time independent of the recent emergency, namely, that there has been an ever increasing tendency of authorities to check and restrict any waste of municipal water. First reactions and publicity seem to have been brought to bear mainly on air conditioning systems as extravagant wasters of water. But there are other and sometimes greater savings of water which might be made. For example, consider the use of water by heating systems using street steam, such as in New York City, where 20,000,000 pounds of steam per year are used without return of this as condensate to the producing boiler plants.

Prior to the existing emergency, New York City used an average of 1,200,000,000 gallons of water per day. By publicity, rigid economy, and restriction, this average has been reduced to 885,000,000 gallons. The annual quantity of condensate from street steam is thus about one per cent of the water now used and while relatively seemingly of no significance, it is still quite a waste in terms of gallons. Not all of this could be saved and whatever is saved is apt to be expensive in first cost to provide for, since one requirement alone would be the necessary house pumps. Possibly a day will come, and not so far away, when something will have to be done about this matter and more or less regardless of expense.

Someone will use the water from a lavatory faucet for making coffee, so that in New York and some other cities, condensate as cooled by and mixed with the building water supply cannot, by law, be used. If, however, the condensate is pumped into the water supply to the sanitary system and kept separate from the city water supply to lavatories, then the use of condensate is not restricted.

It is, of course, easier to separate the water supplies when the building is erected. The National Association of Building Owners and Managers look favorably upon this method, and issue a booklet with full details and net savings. Pennsylvania Railroad Terminal and New York Street Steam use this method in their own buildings.

One should not be discouraged by the experiences of some in the reclamation of water. For example, one large store in New York used condenser water as water supply, but its temperature was high enough to encourage the growth of bacteria. Steam, however, is another matter, for it kills bacteria. Steam condensate is a pure distilled or extremely soft water which in cold weather may in many cases supply all gallonage required.

Even with condensate as now more or less cooled and then discarded to the sewer, it is still possible to make some savings of water. Every pound of street steam to heat domestic hot water supply is now returned to the sewer, but if the heat of its condensate is partially or fully reclaimed we use less steam and have less water to dump. It is not uncommon to observe a fresh air inlet operating as a foul air vent to pass the steam of over hot condensate, sometimes to across the sidewalk. In such cases, either the heat exchanger is too small, or full use of the heat of condensate is not being made. Perhaps there is no heat reclamation for water supply and partial cooling of the condensate is being done solely by a radiator in a heater space, or a vented shaft to atmosphere. Heat exchangers to be efficient must be kept clean and for this purpose should have accessibility by a separate

door without having to disconnect the heater to flush it out.

A city code states that the maximum temperature of water which is allowed for discharge to the sewer is as determined by the President of the Borough of Manhattan. I tried to find out the meaning and wherefore of this flexible clause. Answers varied from 100, 120, 150 to 200F, but finally upon diligent search in public archives, some obscure regulations were found setting the maximum temperature at 100F for psychological effect. However, no one goes around with a thermometer to check conditions and I further learned that authorities are not apt to annoy one when the temperature is not above an upper limit which seems to be fixed by unwritten law at 200F. Below that temperature it is felt that no sewer can be damaged and there will be no offensive odors, nor can seals of traps be forced.

Back in 1929 many large apartment houses were built and in them went a lot of gas refrigerators cooled by water rather than by air. The water cooling method was abandoned for new gas refrigerators in 1932, but some 85,000 of the old ones are still in use in New York City. They average in size about 4 or 5 cu ft, and when new use 3 gallons of city water per hour at 60 to 65F with a discharge to sewer at 90F. This gallonage and final temperature is but part of the story, since the thermostatic water control wears out and generally is not kept in repair. This leaves a $\frac{3}{8}$ in. copper tubing more or less wide open to waste water.

Water can be conserved in many other ways. In Rockefeller Center condensate is used to resurface the ice, while their large garage also makes use of condensate to wash cars. Laundries in hotels can well make a much wider use of condensate. Hot water relief valves waste a lot of water where the closed expansion tanks of hot water heating systems are under size.

Buildings using street steam, if not others, should not be overheated, nor should the domestic hot water supply be overheated. Ventilation necessary when the space is occupied should be stopped at other times, and unnecessary ventilation should be done away with altogether, while heating should be reduced, if not shut off entirely, after working hours. Infiltration can be lessened by weatherstripping, providing vestibule doors, making shafts tight, and separating shipping and receiving rooms by partitions from the remainder of the building. Controls should be sufficient and maintained, radiation balanced and possibly zoned; building and hot pipes should be insulated.

In general the foregoing remarks are applicabl to localities other than New York where an adequat water supply is becoming more and more of a prob lem. Florida, for example, is beginning to realiz that there is a limit to its water supply as occupanc increases. In that case, the source of the water sup ply is mainly by evaporation from the ocean, whereas in many of the northerly states ground water come all the way from upper Canada.

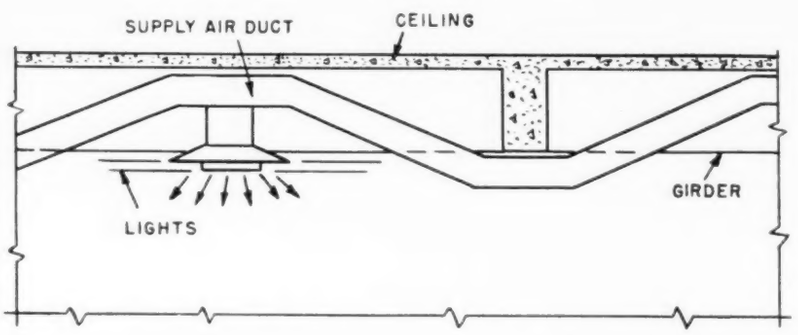
• DUCTS HAVE THEIR ANGLES

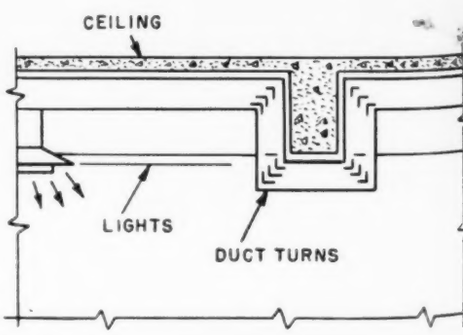
In the old days, when necessary to bend a duct, w used a good old-fashioned elbow of ample sweep an never thought of substituting duct turns, for ther were no such things. As duct turns finally turned u a tendency seems to have crept in of using them to often in places where a good standard elbow woul have sufficed, whereas it was originally intended tha duct turns be used only where the ordinary elbo would make too abrupt a change. While all conclusiv test data are yet to be made, such data as we have ar final enough to prove that a good 90° elbow is slightl less resistant than a duct turn. The popular concep tion seems to be otherwise.

Duct turns in square elbows look pretty on the draw ings and possibly elsewhere, but they are expensive always in the way of access and cleaning and some times are not correctly designed. A further point tha is often forgotten when comparing the resistance of duct turn with an elbow, is the possibility that we ca use ordinary 45 degree or even 22½ degree elbows.

Elbows of such angles are much less resistant tha the best of duct turns. For example, the accompanyin sketches (Figs. 1 and 2) show the use of 22½ degre elbows as compared with 90 degree duct turns in a actual installation where the bottom of the ceiling dif fusers are kept flush with the bottom of the lights fo the sake of appearance. I am of the opinion that th appearance of the Fig. 1 layout would be better tha with the duct turns shown in Fig. 2.

Another misconception is that little is gained b using elbows having a centerline radius of more tha two diameters and that a radius of more than thre diameters gives a slightly increased resistance due t the increased length of duct in the elbow. This is true but it is also true that the longer elbows substitute fo part of the adjacent duct run otherwise used; hence the over-all resistance of the run is reduced.





Ducts Have Their Angles: Fig. 1, left; Fig. 2, right.

NEWS OF THE MONTH

MORE POWER TO AMERICA

is the name of the largest mobile exhibit of electrical products ever built, and which General Electric will take to 150 cities.

General Electric Company unveiled on April 24, its *More Power to America* special train, the biggest electrical display kit every built. The 10-car exhibit train represents the first attempt to display, in one series of related exhibits, the complete range of products for the production, distribution, and industrial utilization of electric power. The silver streamliner is filled with exhibits of more than 2,000 of the most modern electric products, systems, and techniques.

• **150-CITY TOUR.**—The train, launched by the company's Apparatus Department, will visit 150 key industrial centers during 1950 and 1951. At each stop the train will be inspected by invited representatives of electric utilities, manufacturing and transportation industries, armed services, federal government, and municipalities. It will not be open to the general public.

• **EXHIBITS.**—Exhibits in the train are grouped in 11 major sections: Power Generation, Transmission, and Distribution; Drives and Controls, Materials Handling, Welding, Industrial Heating, Renewal Parts, Industrial Lighting, Components for Industry, Measurements, Civic Improvement, and National Security.

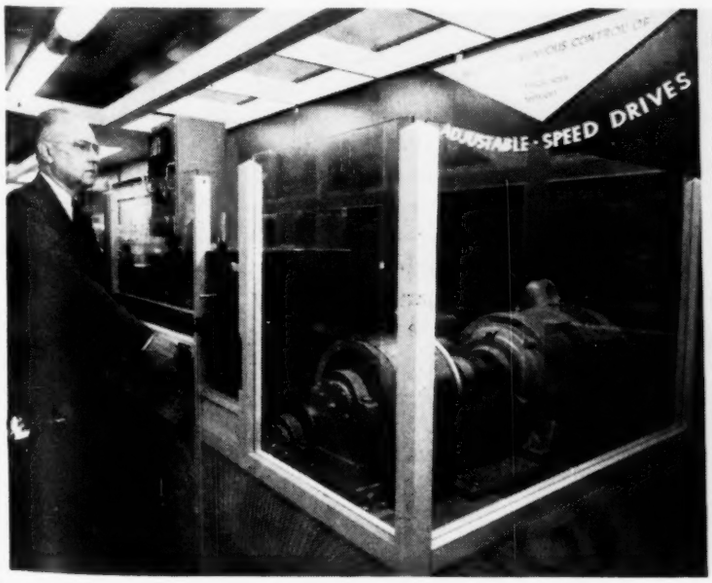
Arrayed throughout the train are displays covering the complete range of apparatus for industry. Individual exhibits—many of them operating—cover such equipment as turbines, substations, transmission equipment, motors of all sizes and ratings, complex drive systems, industrial and street lighting fixtures, precise instruments, welding and heating equipment, diesel-electric switchers, controls, urban transit and railroad equipment.

The More Power to America Special, the General Electric Apparatus Department's 10-car exhibit streamliner, rounds a bend on the New York Central tracks outside of Schenectady, N. Y.

Still others relate to atomic power, weather research, guided rockets, aircraft jet engines, ultrasonics, ship propulsion equipment, fire control systems, and snow-making techniques.

• **OBJECTIVE.**—The company points out that production of durable equipment for modernization and expansion of industry dropped from $20.7 billion in 1948 to $19.7 billion in 1949, and concluded that it is high time American industry started working to reverse this trend.

• **DETAILS.**—C. P. Fisher, Jr., manager of the division responsible for preparation and operation of the ex-



K. H. Runkle, manager of the Industrial Divisions, General Electric Apparatus Department, examines one of the operating drive systems in the Drives and Controls section of the More Power to America Special. This exhibit consists of the continuous moving of a 21-foot-long steel strip, six inches in width, over a series of rollers. High acceleration and fast braking are provided by an amplidyne-controlled d-c drive controlled by the visitor.

J. W. Belanger (left) Assistant General Manager of the General Electric Apparatus Department, and E. E. Parker, Manager of Engineering for the department's Turbine Divisions, examine one of the major exhibits in the Power Generation section of the More Power to America Special. In the foreground are actual turbine components. Buttons adjacent to these components enable visitors to "light up" sections of the turbine where components are located.

hibit train, explained that many problems had to be solved in installing a display of this kind in a "tunnel nine and one-half feet wide and 1,000 feet long." Specifications worked out for the exhibits, he said, took into consideration such factors as size, weight, center of gravity, shock resistance, and electric power requirements.

Wherever possible, actual apparatus has been displayed aboard the train. Where size and weight limitations have made this impractical, he explained, scale models or other representations have been used.

The cars are electrically heated. The undercar power plants supply power to Calrod heaters in the ceiling of each car. This furnishes 18 kilowatts of electric heat and minimizes the need for steam from the locomotive boiler for heating. No steam for heating will be required throughout the tour.

The ten new cars of the train are stainless steel passenger coaches. They were built by the Pullman Standard Car Mfg. Company to the specifications of the Chicago, Rock Island, and Pacific Railroad, which will purchase the cars at the conclusion of the exhibit tour.

SYNTHETIC FUEL COSTS

near competitive levels, Chapman tells Congress in review of research and development.

A broad advance toward competitive liquid fuels from oil shale and coal was announced in March by Secretary of the Interior Oscar L. Chapman in his 1949 annual report to Congress on achievements of the Bureau of Mines in synthetic liquid fuels research and development.

In terms of estimated product cost, refined products now could be produced from oil shale and coal at actual costs averaging 7.3 and 10.8 cents a gallon, respectively. If a profit of 6% on the average unamortized capital investment is added, plus income taxes, the wholesale price for products at the plant would average 9 cents a gallon for those from oil shale and 14.5 cents for those from coal.

• **TREND.**—With more than half of all the fuel energy used in the United States now being provided by petroleum and natural gas, the security of our liquid-fuel position would be greatly enhanced if the supply could be based in an increasing degree on oil shale and coal, which comprise more than 95% of our total fuel reserves.

Trends of the last three decades have been in the opposite direction, however. Since 1920, coal consumption has dropped from about 6 tons per person to 4½ tons, while oil usage has increased from 4 1/3 barrels to 14 1/3, and natural gas from 7,500 cubic feet to about 35,000.

• **SURVEY.**—The Army's Corps of Engineers is making a comprehensive survey of 39 states and Alaska to determine not only the availability of raw materials for commercial synthetic fuels plants but of water, power, transportation, labor, housing, and markets as well. Sample surveys completed in parts of Colorado, Kentucky, Montana, and Texas indicate that there will be no scarcity of suitable sites, for these areas alone could support plants producing up to 7 million barrels of gasoline and oil daily—about 20% more than our present consumption. As the general survey progresses, reports will be published on each of the states having reserves of coal, oil shale, natural gas, and tar sands.

The capital investment now required for a plant producing 10,000 barrels a day of crude shale oil, or 8,840 barrels daily of refined products, is estimated in the Secretary's report at $41,381,000, including facilities for mining, retorting, and refining. This is an average of $4,138 for each daily barrel of crude oil capacity or $4,681 per daily barrel of finished product. This plant would produce jet and Diesel fuel primarily, plus a small amount of fuel oil. The removal of sulfur and nitrogen is no longer a serious problem, the report said, and motor gasoline may be produced readily by modification of the refining process.

• **COSTS.**—Production costs for shale-oil products even now are within or very near the competitive range of those from petroleum. Another problem remains, however—a market for the products. The oil-shale area of western Colorado is sparsely populated and could not absorb the entire output of a 10,000-barrel-a-day plant. Construction of a 50,000 b/d pipeline could provide transportation to large consuming centers at a total cost of less than 1 cent a gallon, but would require the outputs of five 10,000 b/d plants for capacity operations. This means that a large capital outlay of approximately $240 million would be necessary for plants and pipeline at the start of commercial development. Plants alone, sufficient to produce only the heating oil sold in 1948 (259 million barrels), would cost about $4 billion. Total fuel oil sales in the U. S. for heating and other uses were 845 million barrels.

The estimated capital investment for a modernized coal-hydrogenation plant producing 30,000 barrels a day is $246,800,000 or approximately $8,227 for each daily barrel of product capacity. High-octane gasoline would be the principal product. Byproducts would include liquefied petroleum gases and phenols, for which there is a growing demand. As coal-hydrogenation plants are highly flexible, the product distribution readily could be changed to include aviation gasoline which would improve the profit possibilities. Aviation fuel (100/130 grade), now quoted in the coal regions at 16 to 18 cents a gallon, could be sold at the plant for 16.6 cents a gallon wholesale as compared to the 14.5 cents a gallon that would be required for automotive gasoline from coal. Process improvements now under development in the laboratory are expected to reduce these figures.

"Operation of a limited number of coal-hydrogenation plants to produce chemicals as a major part of the products may be very attractive," the report notes. "In addition to phenols, coal-hydrogenation plants can produce important quantities of benzene, toluene, xylene, napthalene, and tar bases, all of which have market prices considerably higher than liquid fuels."

In reviewing 1949's advances in synthetic fuels research and development, the Secretary's annual report presents a detailed summary of the activities and findings at each of the laboratories and demonstration plants of the Bureau of Mines.

Owing to the broad scope of the content and the diversity of interests represented, the Secretary's Annual Report for 1949 on synthetic liquid fuels has been divided into four separate publications. Each has been published by the Bureau of Mines as a Report of Investigations, and the respective titles follow:

R. I. 4651, Part I—Oil from Coal
R. I. 4652, Part II—Oil from Oil Shale
R. I. 4653, Part III—Liquid Fuels from Agricultural Residues
R. I. 4654, Part IV—Oil from Secondary Recovery and Refining

A free copy of any of these publications may be obtained by a written request to the Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa.

NEW AIR FILTER

developed for radioactive dusts may have general industrial use.

A new inexpensive paper-like filter material designed for filtering fine radioactive particles from contaminated gaseous wastes has been developed for the Atomic Energy Commission by Arthur D. Little, Inc., Cambridge, Mass., research and engineering organization. The development may have general commercial or industrial use, for instance in filtering the smoke-stack gases which now cause fumes or smog.

The new material contains treated paper-making fibers in combination with very finely divided mineral asbestos fibers. It is made in soft, flexible sheets which can be pleated and formed into shapes to fit filtering units of large capacity.

• **APPLICATIONS.**—AEC facilities using cooling or ventilating air which might become contaminated with radioactive particles take extreme care to eliminate such particles before the air is discharged into the atmosphere. Air filters developed and used by the Chemical Warfare Service for protection against gas warfare have proved satisfactory, and for some years the Army has been supplying AEC with filter units. With the expansion of the atomic energy program, however, the demand for filters has grown rapidly. In order to develop alternate sources of supply and possibly to reduce filter costs, the AEC initiated a program for filter research and development.

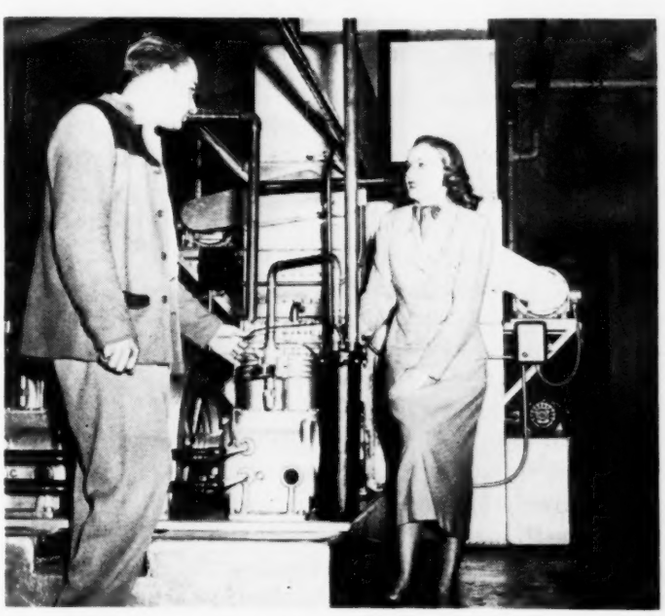
The paper can be made on relatively slow Fourdrinier machines of a type found in a large number of paper mills fabricating soft saturating papers. Thus, the atomic energy program can be assured a diversified source of supply.

It is believed that this filter development may have general use in industrial filtering. One possible use is to filter stack gases now causing fumes or smog in many regions. Such filters may also be used to filter ventilating air in biological laboratories and hospital buildings, especially in operating rooms.

• **UNITS.**—The filter units consist of deep, closely spaced pleats of filter paper fitted into wooden frames. The pleats are spaced and kept in line by deformed separators of ordinary paper which hold them in place and permit easy passage of the air to be filtered. The paper pleats and separators are anchored into wooden frames with plastic adhesives. The frames are in turn glued and screwed at all corner joints to produce a perfectly tight assembly. Gaskets of soft sponge rubber cemented around the edges of the frames prevent air leaks when the frames are clamped into place.

NEWS PIX

At 100 Park Avenue, New York, work has been completed on a sidewalk snow melting system employing 9,000 ft of steel pipe embedded in the 10,000 sq ft sidewalk in which a mixture of prestone and water heated to 180F circulates.



Miss Lois Butcher, 1950 Poly Royal Queen, listens to an explanation of the student-built reversible cycle heat pump which serves the Engineering Auditorium at California State Polytechnic College, San Luis Obispo. Senior air conditioning student Dick Peabody demonstrates the pump.

BUILDING RESEARCH

congress to be held in London in 1951.

A comprehensive congress on building research is to be held in London from September 11th to 20th, 1951, and will be the first of its kind ever to be held. It will mark the rapid developments in building science made since the end of the war and has been arranged because of the great and growing interest shown in the subject in many countries.

• **SPONSORS.**—The congress is sponsored by the British professional institutions and learned societies interested in building science, and by government departments, with the support of representative industrial federations in Great Britain. The Department of Scientific and Industrial Research is providing the central organization for the conference. Papers are being invited from research workers in many countries on a wide range of topics, and arrangements are being made to welcome to the congress a large number of visitors from overseas.

The purpose of the congress will be to review the progress made in research in relation to architecture, building, and the associated branches of civil engineering.

• **SCOPE.**—The scope of the congress is indicated by the following partial list of subjects. The papers presented will deal with recent research and its influence on modern development: The effect of summer and winter conditions on the heating and cooling of buildings; the lighting of buildings; problems of special types of buildings, particularly schools, hospitals, and factories; the acoustics of auditoria and broadcasting studios.

I-B-R SHORT COURSE

to be held at the University of Illinois to cover fundamentals and advanced work.

The program for the fourth I-B-R Short Course on Steam and Hot Water Heating System at the University of Illinois, Champaign-Urbana, Illinois, on June 13 to 16, has been announced by R. E. Ferry, general manager, The Institute of Boiler and Radiator Manufacturers. This course, like the others, will be jointly sponsored by the I-B-R and the University. The fourth short course will have a program for new students who have not previously attended any short course, and a second program for former students who desire more advanced work.

• **SUBJECTS.**—The program for new students will include such classroom problems as designing: A one-pipe forced circulation hot water heating system, a one-pipe steam heating system, a conventional baseboard heating system, and a series loop baseboard heating system.

The program for former students will include such classroom problems as the design of heating systems for multiple housing units, and the design and control of various heating systems for a school building.

The lectures for Short Course No. 4 will be common to the programs of both new and former students. Lecture topics will include: heat loss calculations; piping layouts for hot water and steam heating systems; indirect heating of domestic hot water; controls for hot water and steam heating systems; boiler performance and boiler selection; radiant baseboard performance; and a discussion of panel heating system installation and performance.

Requests for information on the course should be addressed to R. K. Newton, Supervisor of Engineering Extension, Division of University Extension, Room 205, Arcade Building, University of Illinois, Champaign-Urbana, Ill.

ASRE SPRING MEETING

to be held in Kansas City, Missouri, in June. Program announced.

Two technical sessions and two simultaneous conferences are planned for the spring meeting of the American Society of Refrigerating Engineers that will be held at the Hotel Muehlebach, Kansas City, Mo., June 4-7.

• **PROGRAM.**—Sunday, June 4 has been set aside for committee meetings. Officially, the convention gets under way with the Welcome Luncheon on Monday at which time the speaker will be Tom Collins, Humorist.

Following is the program for the first technical session and the Water Conservation Conference:

Monday, June 5

2:00 p.m.—First Technical Session, John G. Bergdoll, Jr., president, presiding. Opening remarks by the president. Response by E. T. Preston, chairman, Kansas City Section. Welcome to Kansas City, by Max W. Pehl, chairman, Convention Committee.

Low Temperature Air Conditioning, by Wm. L. Holladay, Engineer, Hieatt Engineering Co., Los Angeles, Calif.
Testing and Balancing Air Conditioning Systems, by Fritz Honerkamp, Chief Engineer, Anemostat Corp. of America, New York, N. Y.
A New Refrigerant and Its Applications, by C. M. Ashley, Director of Developments, Carrier Corp., Syracuse, N. Y.

Tuesday, June 6

9:30 a.m.—Conference on Water Conservation, Ralph M. Westcott, presiding.

Recapitulation of Chicago Conference and Discussion of Equipment, Daniel D. Wile, Chief Engineer, Refrigeration Engineering, Inc., Los Angeles, Calif. Maintenance of Water Conservation Equipment, by Ralph M. Westcott, Pomeroy and Westcott, Pasadena, Calif.
Four prepared discussions on water conservation problems.

On Tuesday morning there will also be a domestic refrigerator engineering conference. At the second technical session, papers will be presented on frozen food and refrigerated transportation of foods.

• **ENTERTAINMENT.**—Entertainment features include a chuck-wagon barbecue supper and square dance at the Santa Fe Hills Country Club, an informal dinner-dance, and a number of sightseeing and inspection trips of interest to both the technical and non-technical people present. A special program has been planned for the ladies.

The annual meeting of the society is to be held at the Hotel Commodore, New York City, December 3 to 6.

DEGREE-DAYS FOR MARCH, 1950

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING's 22nd Year of Publication of Monthly Degree-Day Data

City	March			Cumulative, September 1 to March 31			Heating Season[1]
	1950	1949	Normal	1949-50	1948-49	Normal	Normal
Abilene, Texas (A)	310	298	273	2061	2629	2034	2061
Albany, New York (A)	1166	910	980	5939	5382	5848	6580
Albuquerque, New Mexico (A)	522	530	527	3607	4275	3970	4298
Alpena, Michigan (C)	1287	1118	1213	6488	5961	6873	8299*
Anaconda, Montana (C)	1150	1107	1081	6904	7663	6737	8357**
Asheville, North Carolina (C)	585	517	555	2523	2569	3831	4232
Atlanta, Georgia (C)	460	386	388	2229	2184	2758	2890
Atlantic City, New Jersey (C)	816	717	806	3656	3551	4437	5176
Augusta, Georgia (A)	387	289	273	1698	1511	2137	2161
Baker, Oregon (C)	902	799	880	5927	6794	5904	7163
Baltimore, Maryland (C)	735	578	701	3423	3279	4163	4533
Billings, Montana (A)	1072	1028	955	6554	6907	6209	7119
Binghamton, New York (C)	1097	872	995	5389	5033	5960	6808
Birmingham, Alabama (A)	414	368	260	2028	2121	2283	2352
Bismarck, North Dakota (A)	1353	1269	1283	8691	8317	8152	9192
Block Island, Rhode Island (C)	939	839	911	4253	4079	4678	5788
Boise, Idaho (A)	775	681	651	5154	5947	4881	5552
Boston, Massachusetts (A)	961	799	908	4727	4364	5230	6045
Boseman, Montana (C)	1098	1083	1096	6736	7503	6993	8521**
Buffalo, New York (A)	1133	961	1032	5449	5055	5800	6822
Burlington, Iowa (A)	948	851	(a)	5363	5515	(a)	(a)
Burlington, Vermont (A)	1280	1057	1088	6523	5932	6584	7514
Butte, Montana (C)	1168	1181	1048	7154	8147	6683	8235**
Cairo, Illinois (C)	614	518	539	3188	3213	3708	3909
Canton, New York (C)	1299	1117	1160	6715	6106	7002	8020
Charleston, South Carolina (C)	297	263	242	1266	1106	1733	1769
Charlotte, North Carolina (C)	509	395	428	2457	2232	2961	3120
Chattanooga, Tennessee (A)	510	432	415	2622	2627	2974	3118
Cheyenne, Wyoming (A)	1035	1020	995	5804	6644	6174	7466
Chicago, Illinois (C)	965	817	845	4979	4852	5246	6077
Cincinnati, Ohio (C)	732	596	676	3660	3589	4351	4684
Cleveland, Ohio (A)	986	862	930	4925	4708	5371	6155
Columbia, Missouri (C)	762	688	694	4183	4402	4597	4922
Columbia, South Carolina (C)	413	312	301	1886	1623	2301	2364
Columbus, Ohio (C)	849	711	778	4312	4144	4891	5398
Concord, New Hampshire (A)	1157	939	1011	6311	5692	6332	7353
Concordia, Kansas (C)	824	808	735	4752	5343	4908	5315
Dallas, Texas (A)	320	268	267	1944	2345	2247	2256
Davenport, Iowa (C)	980	842	893	5383	5361	5718	6289
Dayton, Ohio (A)	895	770	744	4682	4563	4787	5264
Deer Lodge, Montana (C)	1082	1085	1056	6946	7982	7125	8672**
Denver, Colorado (C)	787	765	800	4382	5266	5073	5874
Des Moines, Iowa (C)	1001	892	890	5698	5792	5825	6384
Detroit, Michigan (A)	1070	909	973	5364	5054	5691	6490
Devils Lake, North Dakota (C)	1469	1478	1323	9389	8953	8694	9970
Dodge City, Kansas (A)	744	722	688	4293	5021	4646	5035
Dubuque, Iowa (C)	1069	921	958	5942	5847	6152	6790
Duluth, Minnesota (C)	1427	1267	1265	8129	7487	7945	9483
Eastport, Maine (C)	1165	1031	1110	6146	5875	6612	8520**
Elkins, West Virginia (A)	914	796	763	4606	4505	5019	5697
El Paso, Texas (A)	221	257	282	2094	2778	2383	2428
Ely, Nevada (A)	960	1030	(a)	6089	7604	(a)	(a)
Erie, Pennsylvania (C)	1041	878	973	4845	4555	5407	6273
Escanaba, Michigan (C)	1309	1159	1262	7072	6502	7290	8771
Evansville, Indiana (A)	706	628	620	3759	3809	3968	4244
Fort Smith, Arkansas (A)	507	410	397	2889	3065	3054	3147
Fort Wayne, Indiana (A)	1003	833	818	5236	5001	5321	5925
Fort Worth, Texas (A)	305	255	217	1986	2314	2121	2148
Fresno, California (A)	354	327	316	2434	2694	2199	2334
Galveston, Texas (C)	137	111	78	623	933	1016	1016
Grand Junction, Colorado (A)	728	687	672	5058	5829	5046	5548
Grand Rapids, Michigan (C)	1073	909	964	5448	5170	5827	6535
Green Bay, Wisconsin (C)	1256	1069	1125	7055	6418	6903	7825
Greensboro, North Carolina (A)	612	499	474	3141	2925	3319	3529
Greenville, South Carolina (A)	519	400	446	2605	2380	3185	3380
Harrisburg, Pennsylvania (A)	892	709	803	4461	4266	4880	5375
Hartford, Connecticut (A)	998	825	887	5142	4755	5303	6036
Hatteras, North Carolina (C)	382	401	465	1631	1729	2316	2571
Havre, Montana (C)	1256	1119	1169	8172	7971	7557	8700
Helena, Montana (A)	1066	1124	1004	7257	7993	6615	7894**
Houston, Texas (C)	167	127	65	814	1124	1157	1157
Huron, South Dakota (A)	1258	1065	1092	7409	7290	7167	8004
Indianapolis, Indiana (A)	869	744	756	4609	4576	4855	5298
Jackson, Mississippi (A)	334	265	(a)	1574	1700	(a)	(a)
Kansas City, Missouri (A)	767	684	691	4262	4532	4644	4956
Knoxville, Tennessee (A)	539	491	496	2827	2847	3460	3670
La Crosse, Wisconsin (A)	1225	1038	1033	7023	6648	6611	7322
Lander, Wyoming (A)	1015	985	1028	6444	7505	6694	7947

(a) Data not available.

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

[Table concluded on page 96]

Degree-Days for March, 1950 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING'S 22nd Year of Publication of Monthly Degree-Day Data

City	March			Cumulative, September 1 to March 31			Heating Season[1]
	1950	1949	Normal	1949-50	1948-49	Normal	Normal
Lansing, Michigan (A)	1131	965	1035	5862	5535	6237	7048
Lewiston, Maine (O)	1133	969	1093	6250	5655	6625	7707
Lincoln, Nebraska (C)	912	860	840	5317	5835	5483	5999
Little Rock, Arkansas (A)	468	408	353	2525	2692	2733	2811
Livingston, Montana (C)	1015	963	967	6064	6649	5985	7245**
Los Angeles, California (C)	198	279	239	1283	1699	1255	1504
Louisville, Kentucky (A)	691	589	589	3573	3565	3916	4180
Lynchburg, Virginia (A)	682	566	564	3419	3274	3707	3980
Macon, Georgia (A)	359	321	260	1633	1675	2168	2201
Madison, Wisconsin (C)	1160	1001	1054	6302	6109	6611	7429
Marquette, Michigan (C)	1310	1185	1249	7048	6548	7164	8693*
Memphis, Tennessee (A)	500	438	384	2599	2697	2854	2950
Meridian, Mississippi (C)	365	285	245	1704	1710	2136	2160
Milwaukee, Wisconsin (A)	1107	983	1023	5975	5750	6208	7245
Minneapolis, Minnesota (A)	1264	1103	1094	7227	6910	7044	7850
Montgomery, Alabama (C)	323	269	208	1403	1420	1884	1884
Nantucket, Massachusetts (A)	968	850	899	4508	4368	4811	5957
Nashville, Tennessee (A)	557	493	477	2990	2953	3327	3507
New Haven, Connecticut (A)	944	811	899	4783	4464	5129	5895
New Orleans, Louisiana (C)	180	144	59	720	863	1024	1024
New York, N. Y. (C)	860	701	771	3945	3744	4608	5274***
Nome, Alaska† (A)	1915	1800	1660	8136	9418	8886	14580**
Norfolk, Virginia (C)	534	460	521	2391	2305	3104	3350
North Head, Washington (C)	652	579	623	3936	4155	3755	5452**
North Platte, Nebraska (A)	996	885	875	5691	6161	5681	6366
Oakland, California (A)	389	376	363	2516	2858	2392	3143**
Oklahoma City, Oklahoma (C)	489	467	465	3069	3487	3451	3613
Omaha, Nebraska (A)	950	882	868	5587	5903	5633	6131
Oswego, New York (C)	1153	938	1060	5581	5175	5993	7088
Parkersburg, W. Virginia (C)	788	654	670	3909	3795	4371	4775
Peoria, Illinois (A)	936	805	862	5203	5187	5535	6109
Philadelphia, Pennsylvania (C)	788	637	685	3737	3537	4227	4737***
Phoenix, Arizona (C)	90	148	152	1110	1782	1405	1405
Pittsburgh, Pennsylvania (C)	872	711	787	4196	3965	4734	5235
Pocatello, Idaho (A)	885	815	843	5851	6727	5696	6655
Portland, Maine (A)	1192	986	1017	6270	5711	6105	7218
Portland, Oregon (C)	576	526	558	3867	4070	3732	4469
Providence, Rhode Island (C)	948	765	890	4653	4216	5206	6015
Pueblo, Colorado (A)	734	692	732	4406	5244	4872	5514
Raleigh, North Carolina (C)	506	433	446	2447	2368	3051	3234
Rapid City, South Dakota (A)	1231	1062	1010	6581	6880	6150	7118
Reading, Pennsylvania (C)	857	672	794	4201	3954	4876	5389
Red Bluff, California (A)	398	423	(a)	2603	2917	(a)	(a)
Reno, Nevada (A)	794	767	753	4949	5901	4902	5892
Richmond, Virginia (C)	606	508	543	2937	2828	3449	3695
Rochester, New York (A)	1148	951	1029	5630	5213	5854	6732
Roseburg, Oregon (C)	(a)	512	546	(a)	4010	3636	4428
Roswell, New Mexico (A)	412	358	428	2930	3615	3304	3484
Sacramento, California (C)	350	362	357	2381	2810	2393	2653
St. Joseph, Missouri (A)	828	758	682	4820	5095	4803	5161
St. Louis, Missouri (C)	728	645	657	3794	3966	4309	4585
Salt Lake City, Utah (A)	741	702	722	5009	6133	4866	5555
San Antonio, Texas (A)	189	130	74	1104	1530	1202	1202
San Diego, California (A)	207	272	251	1314	1709	1350	1645
Sandusky, Ohio (C)	953	836	915	4690	4595	5299	6208
San Francisco, California (C)	361	366	353	2207	2506	2123	3264**
Sault Ste. Marie, Michigan (A)	1427	1302	1314	7622	6993	7629	9285**
Savannah, Georgia (A)	278	239	167	1195	1044	1490	1490
Scranton, Pennsylvania (C)	998	820	893	5008	4716	5445	6129
Seattle, Washington (C)	619	543	620	4012	4202	3917	4934**
Sheridan, Wyoming (A)	1122	1041	1048	6775	7131	6837	8008
Shreveport, Louisana (A)	311	244	202	1679	1919	1938	1938
Sioux City, Iowa (A)	1095	984	967	6383	6671	6245	6898
Spokane, Washington (A)	901	836	778	6283	6706	5485	6355
Springfield, Illinois (C)	826	706	760	4446	4503	4951	5373
Springfield, Missouri (A)	731	657	626	3979	4128	4149	4428
Syracuse, New York (A)	1166	917	1004	5657	5206	5984	6893
Tacoma, Washington (C)	655	582	648	4242	4478	4086	5181**
Terre Haute, Indiana (A)	835	717	663	4473	4440	4539	4872
Toledo, Ohio (A)	1031	878	905	5245	4998	5372	6077
Topeka, Kansas (C)	763	698	682	4391	4678	4635	4969
Trenton, New Jersey (C)	856	690	735	4155	3872	4450	4933
Utica, New York (O)	1215	895	989	5892	4965	5955	6796
Valentine, Nebraska (C)	1170	999	980	6409	6739	6205	7039
Walla Walla, Washington (C)	634	631	598	4784	5118	4774	4808
Washington, D. C. (C)	717	565	694	3353	3272	4253	4626
Wichita, Kansas (A)	704	661	648	4043	4545	4421	4673
Williston, North Dakota (C)	1400	1253	1280	8785	8387	8238	9323
Winnemucca, Nevada (C)	(a)	793	767	(a)	6241	5411	6427**
Yakima, Washington (A)	750	658	620	5654	5965	5053	5599

(a) Data not available.
†Nome data are for February.

*Includes August.
**Includes July and August.
***New 48-year normal covering 1898 to 1946.

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

NEW CATALOGS

USE THE POSTCARDS BELOW FOR REQUESTING YOUR COPIES

HUMIDIFIER—A 4-page bulletin describes and illustrates the Daffin Hum-O-Zone, a heavy-duty all-purpose industrial and agricultural humidifier. Photographs show the humidifier in use. Sections describe use in various industries. Specifications are included with details on its automatic controls and methods of installation.—Department H-2, Air Conditioning Division, Daffin Manufacturing Co., Lancaster, Pa. .....**Item C73**

COMMERCIAL REFRIGERATION EQUIPMENT—The 1950 Bush Commercial Refrigeration Catalog, No. 350, illustrating and describing the entire Bush line, contains a section on the new induced draft cooling tower, plus coverage on evaporative condensers. The section on engineering data has been expanded, and layout of the catalog has been revised to facilitate quick reference. — The Bush Mfg. Co., West Hartford 10, Conn. .....**Item C74**

FUEL OIL TREATMENT—A technical folder on fuel oil treatment and sludge removing describes the means of preventing or correcting unsatisfactory conditions in the storing, handling, pumping, heating and burning of industrial fuel oil.—Power Chemicals Division, E. F. Drew & Co., Inc., 15 E. 26th St., New York 10, N. Y. .....**Item C75**

PROTECTIVE COATINGS—Bulletin 7-1 on protective coatings for industry contains information on coatings suitable for protection against corrosive fumes or splash on steel, concrete, and wood surfaces.—The Atlas Mineral Products Co., 41 Walnut St., Mertztown, Penna. .....**Item C76**

SELF-CONTAINED CONDENSERS—The Unicon self-contained remote type air-cooled condenser, consisting of a coil, housing, motor, and fan, is described in a 4-page bulletin U-177 with performance data, dimensions, selection chart and installation drawings.—Kramer-Trenton Co., Trenton 5, N. J. .....**Item C77**

WATER TREATMENT EQUIPMENT—Barnstead demineralizing equipment for production of pure water by an ion-exchange method is described in a 20-page catalog which discusses the difference between distilled and demineralized water and cites case histories of production applications.—Barnstead Still & Sterilizer Co., 133 Lanesville Terrace, Forest Hills, Boston 31, Mass. .....**Item C78**

RUBBER LINED PIPE—Bulletin 6907 describes Manhattan rubber lined pipe for use in industries and mines where there are conditions of corrosion, contamination, abrasion, or flow restricting deposits. — Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J. .....**Item C79**

SAFETY VALVES — Sizing safety valves for pressure reducing regulators, bulletin No. 250 contains test data and charts together with capacity tables of various models of MIPCO safety valves.—Marine & Industrial Products Co., Philadelphia 4, Pa. .....**Item C80**

HEAT EXCHANGER TUBES—An illustrated bulletin, TB-329, on heat exchanger and condenser tubes, concerns the economical choice of appropriate tubing for specific service conditions in heat transfer units and for easy fabrication in heat exchanger apparatus. It is designed to help solve such problems as resistance to corrosion, strength at high and low temperatures, and fabrication problems of bending, expanding and beading. — The Babcock & Wilcox Tube Company, Beaver Falls, Pa. .....**Item C81**

VIBRATION ISOLATORS—Catalog No. 502 illustrates and describes unit-type air-damped Barry-Mounts and mounting bases used to protect electronic equipment and other sensitive apparatus against shock and vibration. —Barry Corporation, 180 Sidney Street, Cambridge 39, Mass. .....**Item C82**

TWO STEEL BOILER CATALOGS—Two complete catalogs of Fitzgibbons Boiler Co.'s full line of products are:—A 12-page reprint of the complete catalog insert in Sweet's Architectural Catalog and the Domestic Engineering Catalog; and an 8-page folder entitled "Fitzgibbons Steel Boilers for Gas Firing." Booklets are 8½ x 11 in size and illustrated with line drawings, photographs, catalog material and engineering data.—Fitzgibbons Boiler Company, Inc., 101 Park Ave., New York 17, N. Y. .....**Item C83**

SWIVEL PIPE COUPLINGS—Catalog No. 50 describes design features and gives complete specifications, working pressures and prices of a complete line of high-pressure and low-pressure All-Flex ball bearing swivel pipe couplings. There are eight basic styles in sizes from ⅜ to 12 inches and for pressures from vacuum to 12000 psi. In addition Catalog 50 illustrates and describes the company's other products which include: steel rotary hose, steel cementing hose, mud mixing guns, marine and barge hose and steel circulating heads.—Gil-Lair Products, Inc., 81 Masonic Court, Pasadena, Calif. .....**Item C84**

FOUNDRY DUST CONTROL—How dust control can be initiated in foundries by a simple water and wetting agent arrangement is the story told in a new folder titled "Foundry Dust Control . . . and Sand Conditioning."—Aquadyne Corp., 220 East 42nd Street, New York 17, N. Y. .....**Item C85**

INDUSTRIAL CONTROL DEVICES — Industrial control devices for temperature, flow, pressure, liquid level and humidity are described in Catalog 8303, 64-pages, two colors, presenting over 100 different models of non-indicating electric, electronic, and pneumatic controllers for industrial applications. A number of important additions to the previous line are shown for the first time, including electronic temperature controllers, self-contained electric temperature controllers, and pneumatic insertion type temperature controllers; magnetic starters and contactors; heavy-duty pneumatic positioning motors; pneumatic automatic reset relays and electric step controllers. — Minneapolis-Honeywell Regulator Co., Industrial Division, Wayne and Windrim Aves., Philadelphia 44, Pa. .....**Item C86**

FIR PLYWOOD SUPPLEMENT—The new 1950 Basic Catalog for Douglas Fir Plywood is punched to fit the previously distributed loose-leaf handbook of Industrial Uses for Plywood and to replace the old plywood catalog in the handbook. The new catalog is a plywood architectural catalog and refers to construction uses, presents basic information on types and grades, and gives information on physical and structural properties, finishing, etc.—Douglas Fir Plywood Association, Tacoma Building, Tacoma 2, Wash. .....**Item C87**

Product Information Service

Use the postage-free postcards below for requesting further information on products mentioned in the following sections of this magazine:

Product Applications **Advertising** **New Catalogs**
News of Equipment and Materials

Simply write in the numbers of the items in which you are interested or, in the case of advertising, the name of the advertiser and the product. Please print your name and address.

PLEASE SEND US MORE INFORMATION—**WRITE IN, below, the H & V Item number of the editorial item or name of advertiser in this issue on which you wish further information.**

Item No. ..... **Item No.** ..... **Item No.** .....

Item No. ..... **Item No.** ..... **Item No.** .....

Item No. ..... **Item No.** ..... **Item No.** .....

Advertiser's Name **Product**

.....

.....

.....

.....

.....

Name.....**Firm**.....
(Please Print)

Street.....**City**.....**Zone**.....**State**.....

5/50

NEW SCOTCH BOILER—A new McKee Super-Matic Scotch Steamboilerplant is presented in a series of looseleaf sheets setting forth specifications, capacities, ratings, and prices. Horsepower ratings are for 12 to 100.—Eclipse Fuel Engineering Co., Rockford, Ill. .....**Item C88**

MOTORS AND DRIVES—In a full-color presentation, the complete U. S. line of electric motors, varidrives, and synchrogear motors for horizontal, vertical, and various special applications are described in an 8-page bulletin. A separate 4-page folder illustrates in full color the U. S. Lubriflush principle of motor bearing mountings. — U. S. Electrical Motors, Inc., Milford, Conn. .....**Item C89**

WATER SOFTENERS—A new line of low price water softeners suitable for small industrial and residential application is described and illustrated in a spiral bound book. — The Permutit Co., 330 West 42nd St., New York 18, N. Y. .....**Item C90**

VENTILATING EQUIPMENT—Frigid ventilating equipment including pedestal fans, domestic and industrial exhaust fans, automatic shutters, spray booth fans, and pressure blowers are described in a 12-page, 2-color catalog with dimensions, prices and specifications.—Circulators & Devices Mfg. Corp., 128-168 Thirty-second St., Brooklyn 32, N. Y. .....**Item C91**

HOT WATER CONTROLS—A special issue of Hoffman's Engineering News (No. 13) covers application of Hoffman 900 Series controls to forced hot water systems. All issues of Engineering News are available on such subjects as panel heating, air vents for heating systems, ratings of low pressure float and thermostatic traps, etc.—Hoffman Specialty Co., Indianapolis 7, Ind. .....**Item C92**

FAN DATA BOOK—Chelsea catalog gives engineering information, dimensions, performance, and prices regarding all types and sizes of fans for industrial, commercial, and residential applications; includes many new types of fans. Information covers direct or belt driven window fans, industrial pressure fans, mancoolers, penthouse units, duct booster fans and a full line of automatic counter-balanced shutters for all applications. Chelsea Fan & Blower Co., Inc., 1206 Grove St., Irvington, N. J. .....**Item C93**

DUPLEX STRAINERS—DuoFlo duplex strainers featuring cast iron construction, and two perforated baskets allowing one strainer to be cleaned while the other is in operation, are described and illustrated with tables of dimensions and application data in Bulletin 100. Line includes both suction and discharge strainers.—Sheffler-Gross Company, Drexel Building, Philadelphia 6, Pa. .....**Item C94**

Product Information Service

Use the postage-free postcards below for requesting further information on products mentioned in the following sections of this magazine:

Product Applications **Advertising** **New Catalogs**
News of Equipment and Materials

Simply write in the numbers of the items in which you are interested or, in the case of advertising, the name of the advertiser and the product. Please print your name and address.

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

HEATING AND VENTILATING
148 LAFAYETTE STREET
NEW YORK 13, N. Y.

READERS' SERVICE DEPT.

REFRACTORY CONCRETE—A revised edition of the booklet "Lumnite Refractory Concrete" carries information on refractory and heat-resistant concrete with how-to-do-it information on mixes, proportions of Lumnite and various aggregates. Selection tables cover proper types of refractory concrete for a wide range of temperatures and insulating conditions.—Lumnite Division, Universal Atlas Cement Co., Chrysler Bldg., New York 17, N. Y. .....**Item C95**

NAFM FAN STANDARDS—The National Association of Fan Manufacturers, Inc., has published Bulletin 110 entitled "Standards, Definitions, Terms and Test Codes for Centrifugal, Axial and Propeller Fans," for distribution to the public. The bulletin includes under one cover all information previously published in four separate bulletins as well as new tables on size standards for various types of fans and illustrations of revised fan arrangements. Bulletin 110 covers the classification and air-moving equipment, standards, terms and definitions in use by the fan industry, and standard codes for air and sound measurements. — National Association of Fan Manufacturers Association, Inc., 2159 Guardian Building, Detroit 26, Mich. .....**Item C96**

PRESSURE REGULATING VALVES—A 12-page bulletin covers the Swartwout line of low pressure regulating valves for controlling gases and liquids in level temperature or pressure requirements. Bulletin S-22-C, printed in two colors and illustrated with photographs, diagrams and line drawings, gives full specifications and selection data on Swartwout regulating valves, valve accessories and pressure master controls.—The Swartwout Co., 18511 Euclid Ave., Cleveland 12, Ohio. .....**Item C97**

RADIATOR VALVES AND TRAPS — Section 10-11 of the Marsh series of standard-size, looseleaf-punched bulletin is a new 16-page addition covering the company's line of radiator valves and traps including packless valves and renewal bonnets and thermostatic diaphragm traps for low, medium and high pressure service. Photos and dimension diagrams are provided.—Marsh Heating Equipment Co., Skokie, Ill. .....**Item C98**

STEAM PLANT EQUIPMENT — A new Yarway bulletin, No. G-1307, is a revised issue of the 12-page condensed catalog on Yarway steam plant equipment. Products shown include valves, liquid level indicators, expansion joints, traps, strainers and nozzles. — Yarnall-Waring Co., Mermaid Lane, Philadelphia. .....**Item C99**

FANS AND PULLEY DRIVES—Fans, V-pulleys, and V-belts for fans, designed for refrigeration and air conditioning, are described and illustrated in an 8-page bulletin. Sizing and capacity data are included.—Maurey Mfg. Corp., 2907 So. Wabash Ave., Chicago 16, Ill. .....**Item C100**

AIR RECOVERY EQUIPMENT—Bulletin 117-C covers the recently introduced standard filter size Type C air recovery unit and other types of equipment for reclaiming odorous conditioned air. Ventilation data, equipment specifications, arrangement details, capacity and resistance curves and various types of applications are contained in this 16-page publication. —W. B. Connor Engineering Corp., 116 East 32nd Street, New York 16, N. Y. .....**Item C101**

STEEL BOILER TUBE DATA—A new bulletin of technical data on electric - resistance - welded steel boiler tubes, TB-331, furnishes tables of maximum allowable working pressures, conforming to ASME Specification SA-178, for different diameters and gages of tubes for water-tube and fire-tube boilers. Another table determines the weight in pounds per lineal foot of steel tubes in various minimum wall sizes.—The Babcock & Wilcox Tube Company, Beaver Falls, Pa. .....**Item C102**

PUMPS AND WATER SYSTEMS—The complete line of Peerless water systems, including deep and shallow well jet systems, the Water King pumping system, deep well reciprocating and other pumps, is offered in Bulletin B588. Cut-away views and engineering data are presented.—Peerless Pump Div., Food Machinery and Chemical Corp., Indianapolis. ....**Item C103**

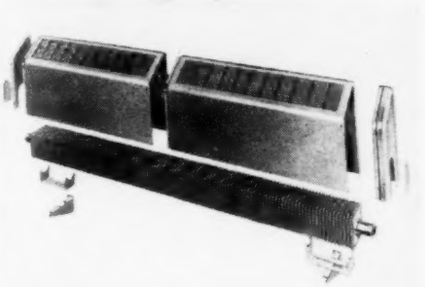
STEAM-HOT WATER CONVERTORS — Paracoil convectors for production of hot water in a steam-to-water heat exchanger are described and illustrated in Bulletin 70, Section K, 12 pages, 2 colors. Dimension and capacity data on 88 standard sizes for steam pressures from 0 to 25 lb per sq inch and for nine temperature ranges are given with pressure drop for each unit, installation diagrams, and sizing tables. — Davis Engineering Corp., 1064 East Grand St., Elizabeth 4, N. J. .....**Item C104**

NEWS OF EQUIPMENT AND MATERIALS

Should additional information be desired regarding items described, please write in item numbers on the postage-paid post card on page 97.

Trane Wall-Fin

NAME—Trane Wall-Fin radiation.
PURPOSE—Extended surface type of heating surface for commercial and industrial installations.

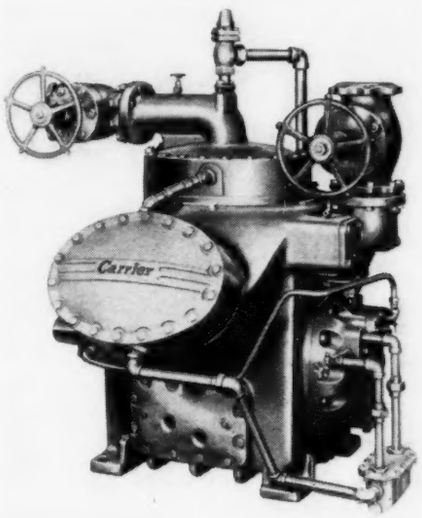


FEATURES—Unit lengths lock together with push-in rivets. The hanger rides with expansion and contraction of the heating element. This prevents damage from buckling and loosened supports. Nonferrous and steel pipe heating elements are available.
SIZES AND CAPACITIES—In standard lengths from 2 to 12 ft in 6-inch increments. A variety of cabinets run from 2 to 6 ft lengths in 6-inch increments; grilles in lengths from 2 to 10 ft in 6-inch increments.
LITERATURE AVAILABLE — Bulletin DS-392.
MADE BY—*The Trane Co., La Crosse, Wis.*

Item E151

Carrier Compressor

NAME—Carrier reciprocating compressor.
PURPOSE—Reciprocating compressor developed to meet air conditioning and refrigeration applications requiring sizes from 100 to 150 hp.
FEATURES—Units can be either direct or belt driven, powered by motor, gas or Diesel engine, or steam turbine with gear. They can be adapted for operation as dual units from a single motor with a double shaft. Increased efficiency is claimed because of new design in cylinder unloading which also provides unloaded starting so that normal torque motors may be used. Compressor can be used with Freon 12, Freon 22 and ammonia. Compressor can be mounted on upper floors without the need of massive foundations as weight and vibration have been minimized. Each cylinder is provided with removable and interchangeable cylinder sleeves with parts accessible for inspection. Lubrication is by positive pressure to all bearing surfaces. Maximum speed is 900 rpm for Freon 12 and 720 rpm for ammonia.
SIZES AND CAPACITIES—Model 5J40 —a 4-cylinder machine using Freon 12—rated at 100 tons. Model 5J60 —a 6-cylinder compressor using Freon 12 rated at 150 tons.



MADE BY—*Carrier Corp., Syracuse, N. Y.*

Item E152

GE Photoelectric Eyes

NAME—GE photoelectric light source and phototube holder.
PURPOSE — Photoelectric operation of relays for control or other purposes.
FEATURES — The newly designed general purpose light sources have simple snap-on covers that make possible lamp replacement in about 20 seconds. In addition, prefocused lamps are used throughout, assuring that the filament is in the proper position in relation to the transmitting lens of the light source. The phototube holder is furnished complete with phototube, lens, masks, and 9 ft of connecting cable. For mounting convenience, both a mounting clamp (providing 360 deg horizontal and 120 deg vertical adjustment) and a standard

pipe thread for ½ inch conduit are provided. Phototube holders and the 3-inch lens light source are of the gasketed, bolted form which makes them weather-resistant and dustproof.
MADE BY—*General Electric Co., Schenectady 5, N. Y.*

Item E153

Dole Valve

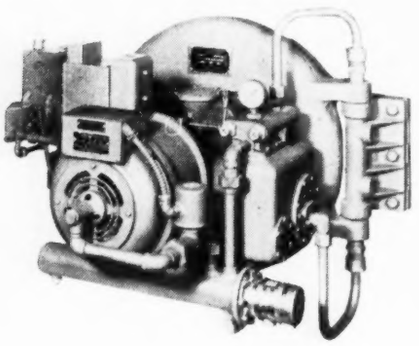
NAME—Dole flow control valve.
PURPOSE—Device to provide a constant flow of hot water regardless of pressure.
FEATURES—Valve is now available as a separate unit to control the flow of water as in a tankless heater. With this valve at the inlet, the amount of water passing through the tankless heater is limited to the rated capacity of the heater. Valve will control the flow of water at any pressure from 15 to 150 lb per sq in.
LITERATURE AVAILABLE—Pamphlet No. 3169D 2M.
MADE BY—*The Dole Valve Co., 1933 Carroll Ave., Chicago 12, Ill.*

Item E154

Ray Oil Burner

NAME — Ray oil burner, size 10, Type AR.

PURPOSE—Oil burner for automatic operation in capacities large enough



to serve up to 700 boiler horsepower.

FEATURES—A 7½ hp motor is used on size 10. Motor is air cooled, longitudinally ventilated, and has extra large oil lubricated ball bearings. A cast aluminum auxiliary reservoir, internally reinforced, has a capacity of about 2½ gallons. It is flange-mounted to simplify assembly and pump alignment. Steel tubing at upper and lower hinge connections replace standard pipe and fittings. Heater element baffling results in two-pass operation and greater effective heating capacity. The heater element operates on 5,000 watts. Burner, which uses No. 6 oil, has automatic thermostatically controlled electric oil preheater of 5,000 watts. A special valve meters the oil to the burner and this operation is said to be unaffected by changes in fuel viscosity.

MADE BY—*Ray Oil Burner Co., 410 Bernal Ave., San Francisco 12, Calif.*

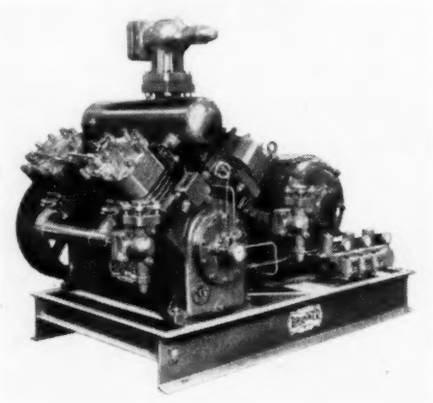
Item E155

Brunner Compressor

NAME—Brunner compressor, Model R-75000.

PURPOSE — Eight-cylinder compressor for air conditioning or refrigeration applications.

FEATURES—Unit is available as a compressor only, in combination with a motor and bed plate, and in combination with motor, bed plate and water cooled condenser. The 8-cylinder, 90-degree V-type compressor is built two cylinders to a block, with the blocks bolted to the crank case. Pistons are of high grade cast iron ground to size and fitted with two compressor rings and one oil control ring. The crank shaft is supported by three bronze bearings pressed into the bearing supports. Pressure lubrication is supplied by a large size pump attached to the end bearing and driven directly from the crank shaft. Both suction and discharge valves are of the reed type. By means of apparatus which unseat the suction valve reeds, cylinders are unloaded on starting the compressor. The same apparatus can be used to reduce the capacity from 75, 50 or 25% of the rated capacity. Openings in two of the four



cylinder heads are provided for installation of relief valves if required.

SIZES AND CAPACITIES—Six models of 50, 60 and 75 hp.

LITERATURE AVAILABLE—Bulletin.

MADE BY—*Brunner Manufacturing Co., Utica, N. Y.*

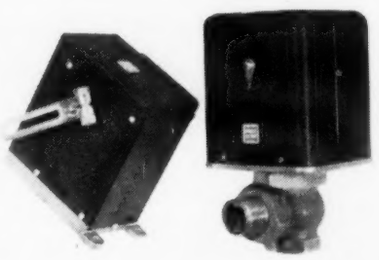
Item E156

Barber-Colman Control

NAME—Barber-Colman unit ventilator control.

PURPOSE—Control for use with unit ventilators installed in schoolrooms, auditoriums, and gymnasiums.

FEATURES—Device has been redesigned for improved performance. Cam-operated limit and auxiliary switches give positive control of all interlocking unit ventilator control cycles. Operators, powered by high output electric motors, are said to be noiseless in operation. Controls are supplied with mounting brackets and adjustable linkages for easy installation in any unit ventilator. For minimum servicing of units in inaccessible locations, oil-immersed operators can be supplied.



MADE BY — *Barber-Colman Co., Rockford, Ill.*

Item E157

Aqua-Clear Feeder

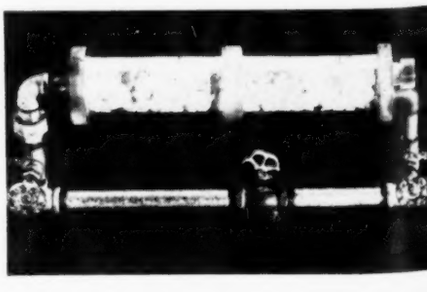
NAME—Aqua-Clear feeder.

PURPOSE—System of adding corrective chemical solution to water system in homes, industrial plants and apartments to prevent rusty water.

FEATURES—Crystals are placed in a feeder to dissolve slowly as the water passes over them. A microscopically thin film is said to develop to form the protection on the inner surfaces of tanks and pipes and to prevent water from coming directly in contact with the metal. Makers claim that this film will stop further rust, or will hold existing rust formations in check, and that it stops the electrolytic action which frequently causes destruction of metal in water systems.

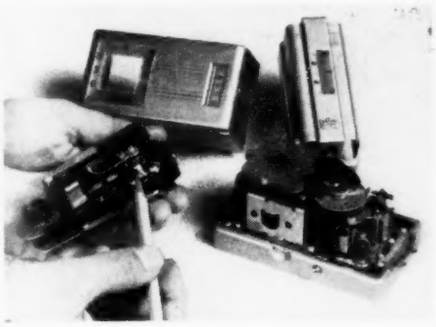
MADE BY — *Sudbury Laboratory, South Sudbury, Mass.*

Item E158



M-H Comfort Thermostat

NAME — Minneapolis - Honeywell Comfort thermostat.
PURPOSE — Control for domestic heating systems designed to follow changes in outside weather.

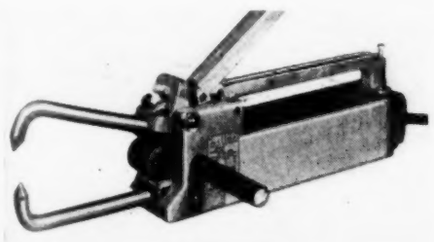


FEATURES—Electric heat is applied directly to the bi-metal element, to function whenever the heating system operates. This, it is claimed, results in greater sensitivity. In periods of mild weather, this control calls for infrequent and very short cycles of the heating system. As the outside temperature drops, the cycles become more frequent and for progressively longer time periods. The bi-metal assembly shuts off the burner before the desired room temperature is reached, and latent heat in the entire heating system is called on to bring room temperature up to the control point. The burner will start again when the room temperature falls but a fraction of a degree. This feature is available in all the company's low voltage thermostats for automatic fuel-burning.
MADE BY—*Minneapolis-Honeywell Regulator Co., Minneapolis 8, Minn.*

Item E159

Miller Welder

NAME—Miller portable spot-welder, Model LMSW-52.
PURPOSE — Portable unit for spot-welding.

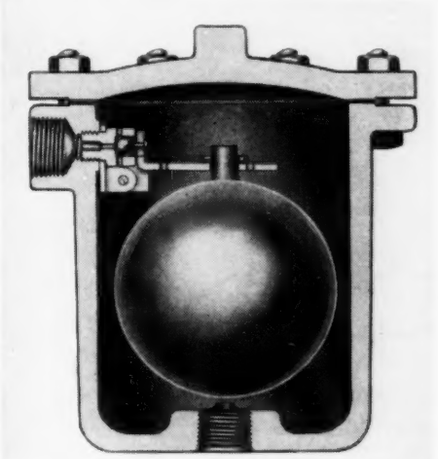


FEATURES—Unit is said to be capable of spot-welding two pieces of 13-gage stainless or mild steel, or two pieces of 16-gage galvanized metal. A handle that may be attached to either side of the welder is provided for easy operation. A multi-pressure tong lever enables a tight spot for welding operations. Unit weighs 31 lb.
MADE BY — *Miller Electric Manufacturing Co., Appleton, Wis.*

Item E160

Crane Vent and Drain Valve

NAME—Crane automatic vent and drain valve.
PURPOSE—To vent and drain piping systems by means of an automatic ball type seating mechanism.
FEATURES—A simplified ball-type seating mechanism is used instead of the customary disc to provide more accurate seating and longer life. Valve is easy to install in water or oil piping systems to remove entrapped air, or in compressed air systems to remove water and oil. Operation is fully automatic, and the cycle of filling and emptying keeps repeating with each accumulation. Body and cap of the valve are cast iron; the float is copper; the ball is of hardened stainless steel.

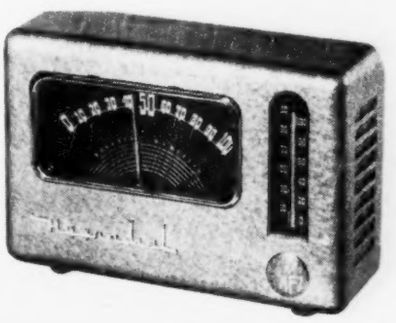


SIZES AND CAPACITIES—In sizes to take care of all air requirements up to 150 lb per sq in. and water requirements up to 125 lb per sq in.
MADE BY—*Crane Company, 836 S. Michigan Ave., Chicago 5, Ill.*

Item E161

Abbeon Hygrodial

NAME—Abbeon Hygrodial.
PURPOSE—Instrument for giving direct readings of relative humidity and temperature.
FEATURES—The humidity scale is



graduated into 10 equal divisions from 0 to 100%. The humidity sensing element consists of 216 inches of fine blond human hair to provide sensitive response. The thermometer is of the lens front type, said to be accurate within 1 degree at 70F.
MADE BY—*The Abbeon Supply Co., 58-10 41st Drive, Woodside, New York City.*

Item E162

Dual-Flow Fitting

NAME—Master Dual-Flow fitting.
PURPOSE—One fitting to carry both supply and return for radiators in a one-pipe forced hot water system.
FEATURES—Only one fitting is required for each radiator. These fittings, which are designed to operate on one main, are guaranteed to give perfect circulation of water in each radiator, regardless of position.
SIZES AND CAPACITIES — Available

in four sizes in bronze for sweated fitting or three sizes in cast iron.
MADE BY—*Mel Products Co., New Haven, Conn.*

Item E163

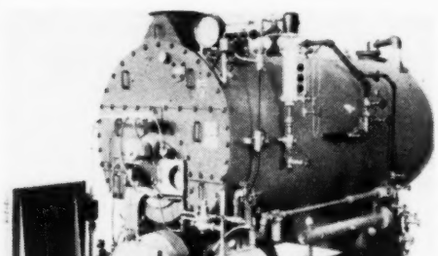
Home Precipitron

NAME—Westinghouse precipitron, Type PH-121.
PURPOSE—Electrostatic air cleaner for the home.
FEATURES—Unit has been redesigned. Air flow arrangement has been changed to simplify duct connections which now are horizontally straight through instead of vertically down, horizontally out. Overall power requirements are 60 watts instead of the 80 watts used by the previous model. It cleans the same quantity of air—1,200-1,500 cfm. Other design improvements include: Power pack placed in the cabinet; installation of the control panel in the wall of the cabinet proper; access to interior through top panel; addition of two water nozzles to spray header assembly; and, a new control timer that automatically sequences the washing cycle once initiated.
MADE BY—*Westinghouse Electric Corp., Sturtevant Division, 200 Readville St., Hyde Park, Boston 36, Mass.*

Item E164

Cleaver-Brooks Boiler

NAME — Cleaver-Brooks self-contained boiler, Model LR.
PURPOSE—Self-contained boiler for use with heavy oils or gas.
FEATURES — Included among the model's features is a rotary burner, compact and fully automatic, which provides flexibility in burning heavy oils or industrial gases. Boiler is of 4-pass fire tube design. A single, low-speed, low-power consumption blower furnishes all the air for combustion. This results in less weight and reduction in sound levels. A totally enclosed, drip- and dust-proof panel protects all major electrical controls. Electronic combustion safety devices and dual low-water cut-offs are standard equipment. The design of the combination gas-oil burner permits rapid changeover from oil to gas or the reverse. Unit is a boiler of all-welded construction, meeting standards of the A.S.M.E. boiler code and leading insurance underwriters. Burners are approved by Underwriters' Laboratory.

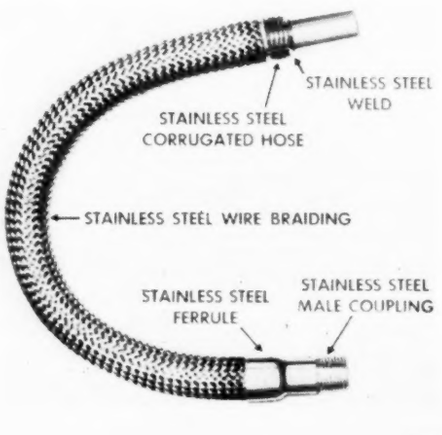


LITERATURE AVAILABLE — Catalog SG-142.
MADE BY—*Cleaver-Brooks, 326 E. Keefe Ave., Milwaukee, Wis.*

Item E165

Johnson Metal Hose

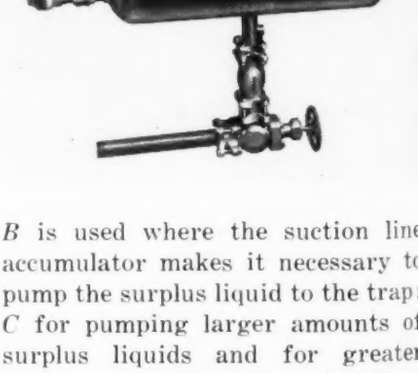
NAME — Johnson flexible stainless steel hose.
PURPOSE—A stainless steel hose for use under pressure or vacuum and for fluids corrosive to ordinary bronze seamless hose.
FEATURES— Hose is capable of conveying material under extremely high temperatures. It is available as open wound or close wound types and may be obtained either braided or unbraided and with or without stainless steel welded male couplings attached. It is made for large working pressures.
SIZES AND CAPACITIES—For inside diameters of ¼ to 1½-inch.
MADE BY—*Johnson Metal Hose Inc., 226 Mill St., Waterbury 88, Conn.*



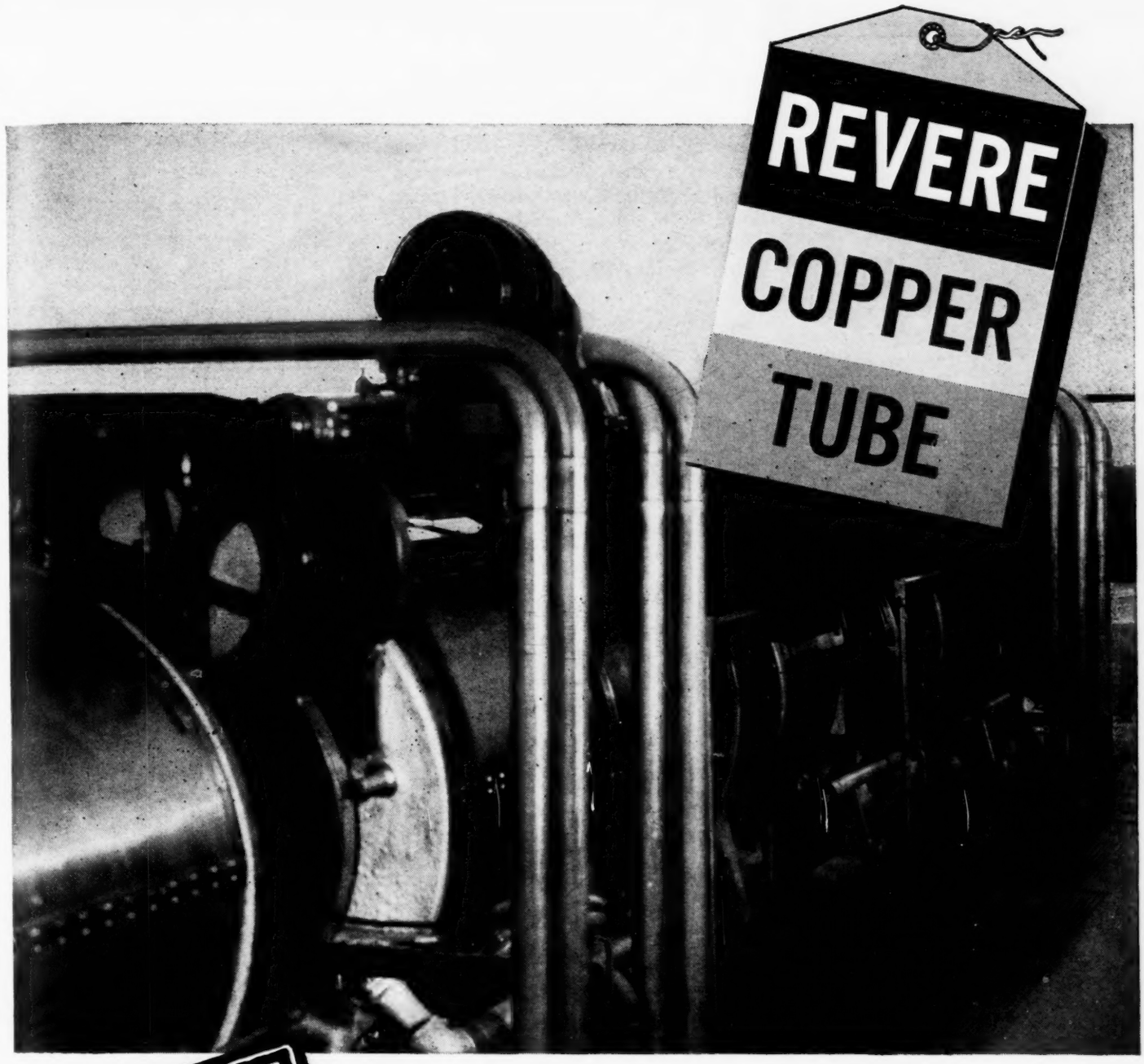
Item E166

Phillips Return System

NAME—Phillips liquid return system.
PURPOSE—Means for returning refrigerant liquid from a suction line trap to the liquid receiver to protect the ammonia compressor.
FEATURES—Where the suction line accumulator is above the level of the liquid receiver, a simple dump trap system is used. Three types of systems are available. *A* system is used where a free drain of surplus low temperature liquid occurs from the accumulator to the trap when the trap is at low pressure; *B* is used where the suction line accumulator makes it necessary to pump the surplus liquid to the trap; *C* for pumping larger amounts of surplus liquids and for greater lifts. It is claimed that with these systems, dry compression is assured.
SIZES AND CAPACITIES — Available in sizes up to 1,000 tons.
LITERATURE AVAILABLE—Bulletin.
MADE BY—*H. A. Phillips & Co. 3255 W. Carroll Ave., Chicago 24*



Item E167



OK for Industrial Piping

● Revere Copper Tube is frequently recommended for conveying industrial fluids in paper mills and other process applications. This tube comes in a variety of tempers, lengths and gauges which make it suitable for a wide range of such applications as well as for heating, plumbing and air conditioning installations.

Revere provides Copper Water Tube for use with solder or compression fittings; type B Copper Tube for installations requiring outside diameters of SPS pipe and brazed fittings; Red-Brass Pipe and Copper Pipe for use with threaded fittings. Every length of Revere pipe and tube is marked with the name Revere. Always look for this mark as your assurance of fine, uniform quality.

Revere pipe and tube are handled by leading distributors in all parts of the country. The Revere Technical Advisory Service is always glad to serve you.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

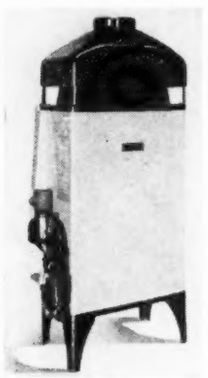
• • •

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.
Sales Offices in Principal Cities, Distributors Everywhere

For more information on products advertised, use Inquiry Card, page 97

Watrola Heat Generator

NAME—Watrola heat generator.
PURPOSE—Hot water system for residential and industrial space heating.
FEATURES—Unit comes completely assembled ready to install. A modulating flame control and a safety pilot control are used. It can burn natural or mixed gas with a content from 1,000 to 1,200 Btu. It has a 1¼-inch I.P.S. water inlet and outlet; a ¾-inch I.P.S. gas inlet and a 6-inch vent. Working pressure is 150 lb per sq in.



SIZES AND CAPACITIES—Top output capacity, 120,000 Btu per hr when operating at a rated input of 150,000 Btu per hr. It will heat 240 gal of water per hour at a 60F rise.
MADE BY—*Watrola Sales Co., Berkeley, Calif.*

Item E168

Desomatic Air Dryer

NAME—Desomatic Air dryer.
PURPOSE—Air dryer for use in recreation rooms, closets and small industrial spaces.
FEATURES—Humid air from the space to be dehumidified is drawn past the dust filter and through a silica gel bed where a large amount of water vapor is adsorbed. After 90 minutes of operation, the valve mechanism closes the dry air outlet and opens the wet air outlet. An electric heater in the silica gel bed is energized and the adsorbed moisture is discharged as warm water vapor to an outside outlet. After 30 minutes, the valves shift to the drying position and the heater is de-energized. With 80F and 60% relative humidity, unit will remove 8.5 lbs of moisture per day. It will handle 25 cfm dry air and 18 cfm wet air discharge.
MADE BY—*Daly, Merritt & Sullivan, Inc., 935 Hughes Court N.W., Washington 7, D. C.*

Item E169

Timken Gas Boiler

NAME—Timken Silent Automatic gas-fired boiler.
PURPOSE — Boiler for residential heating using gas as fuel.

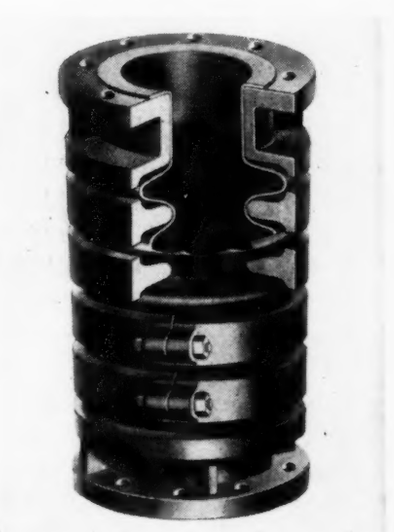
FEATURES—The gas boiler combines small-home compactness with high efficiency. The unit consists of a wall-flame mono-port burner and copper tube boiler equipped with maze-type baffles for maximum heat extraction. It has the necessary controls. When the boiler is equipped with an external water heating coil and circulating pump, available as extra optional equipment, domestic water may be heated the year around. The cabinet is fully insulated and occupies less than 5 ft of floor area. It stands only 42 inches high. The new furnaces and boilers are fully tested and listed by AGA Laboratories.
SIZES AND CAPACITIES—Output rating 80,000 Btu.
MADE BY—*Timken Silent Automatic Division, The Timken Detroit-Axle Co., Jackson, Mich.*

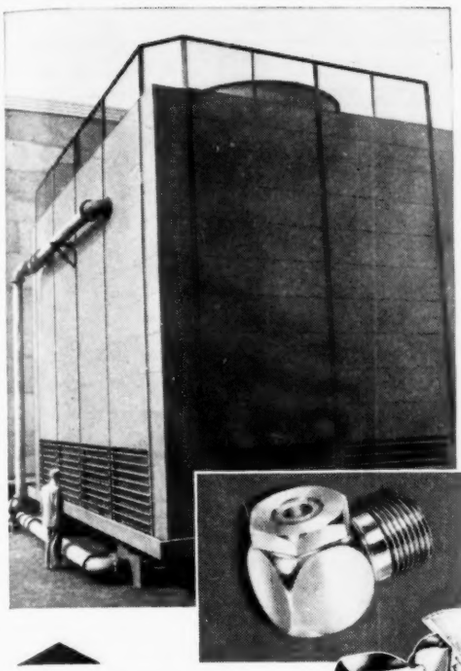
Item E170

Controlled-Flexing Joint

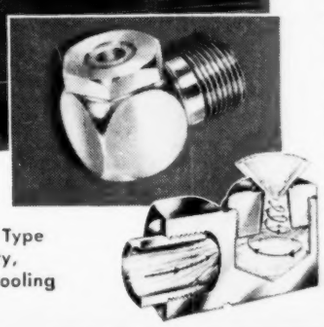
NAME—Controlled-Flexing Joint.
PURPOSE—Packless type joint to take care of expansion and contraction in high pressure pipe lines due to temperature changes.
FEATURES—Made of copper, stainless steel or other alloys, they are available in a large variety of sizes and are said to be suited for locations where space is limited. It is used in place of pipe bends, and saves this added pipe and insulation costs. Unit is fabricated with single or multiple corrugations. It may be obtained with flanged or welded ends. Units with stainless steel liners, tie-rods and special flanges and welding combinations are available for individual needs. Lateral motion is figured at 1/16 inch per corrugation or a maximum offset of one inch can also be handled. Joints operate under pressures to 300 lbs per sq in. and temperatures to 1600F. Joint without control ring available for lower pressure.
SIZES AND CAPACITIES—3- to 24-inch I.D.
MADE BY—*Chicago Metal Hose Corp., Expansion Joint Division, 1306 South Third Ave., Maywood, Ill.*

Item E171





A typical Binks Type "K" heavy-duty, induced draft cooling tower.



Clog-proof Rotojet nozzles are used in both the spray-filled and deck-filled towers.

For large scale water cooling . . .

Binks Type "K" Towers cut your costs

Eliminate costly water consumption

Let a Binks Type "K" heavy-duty, induced draft tower cut your cooling-water costs by reducing water consumption to the minimum. The same cooling water is circulated over and over. A small power charge for pumping takes the place of a big water bill.

Assure better performance

Type "K" cooling towers give high cooling efficiency...the correct air to water ratio. They create their own breezes...are independent of natural air circulation. This is a big advantage in crowded locations. Binks Rotojet Nozzles insure correct fluid breakup for maximum heat dispersal.

Binks Type "K" towers are used extensively in connection with large-scale air conditioning, refrigeration, and related applications. They are made in a range of standard sizes in both deck-filled and spray-filled models. A Binks engineer will gladly help you solve cooling problems.

Send today for technical bulletins describing Binks Type "K" Induced Draft Cooling Towers. Ask for:

Bulletin 36—Type 2KS Spray Filled Cooling Towers (150 to 645 GPM)

Bulletin 37—Type 2K-W Wood Filled Cooling Towers (150 to 495 GPM)

Bulletin 39—Heavy-duty Type "K" Cooling Towers (1000 to 3000 GPM)

THERE'S A BINKS TOWER FOR EVERY COOLING JOB

Binks MANUFACTURING COMPANY

REPRESENTATIVES IN ALL PRINCIPAL CITIES ■ 3120-38 CARROLL AVENUE, CHICAGO, ILL.

---

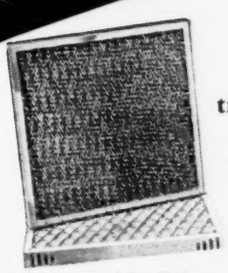
*Airsan** Air Filter Protection Means Effective Dust Collection

permanent

cleanable

viscous type

uniform air flow



Airsan expanded metal face plate acts as a lint arrestor to provide easier cleaning and servicing and distributes air evenly over entire filtering area, providing high filtering efficiency and dust holding capacity with low resistance. Other features include all galvanized construction and full bronze welded corners.

Airsan Air Filters available in standard 1" and 2" thickness with filters for industrial and special applications in 2" and 4" thickness.

Holding frames (for V type or straight banks) are made for all type filters.

* FORMERLY AIRCOR

Air Filter Corporation

108 N NORTH WATER ST. • MILWAUKEE, WIS.

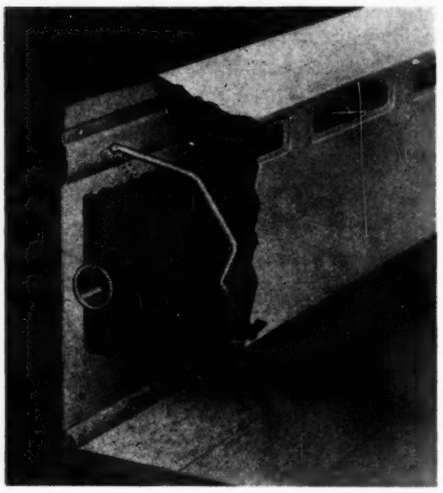
Canadian Representative

DOUGLAS ENGINEERING CO., LTD., MONTREAL

A Few Distributorships Available. Write for Details.

Vulcan Baseboard Hanger

NAME—Vulcan baseboard radiation rod hanger.
PURPOSE—Means for speeding up installations of baseboard by use of a specially designed hanger.



FEATURES—New rod hanger is said to speed up installations of Vulcan baseboard by suspending radiation directly from the backing which is an integral part of the installation. This eliminates the spotting and drilling of holes, and insertion of screws. Knockouts in the backing are easily punched out on the job as required. Rod hanger is inserted, pushed down between fins, and speed nut is pushed up snug against bottom of fins. Unit enables easy adjustment of pitch of the radiation. Hanger can be used for non-recessed or semi-recessed installations.
SIZES AND CAPACITIES—Two sizes, 1 and 1¼ inches.
MADE BY—*The Vulcan Radiator Company, 26 Francis Ave., Hartford 6, Conn.*

Item E172

Yoloy Steel Pipe

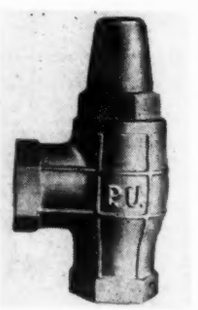
NAME—Youngstown Yoloy pipe.
PURPOSE—For applications where corrosion resistance is involved and where piping is concealed in industrial plants and commercial buildings such as in radiant heating applications.

FEATURES—This pipe is a unique nickel-copper low-alloy steel produced as continuous weld pipe, is easy to weld, bends and fabricates readily, has high tensile strength, high resistance to shock, vibration and abrasion, and is high in corrosion resistance. Available for prompt shipment.
SIZES AND CAPACITIES—From ¾ to 3 inches in diameter.
MADE BY—*The Youngstown Sheet and Tube Company, Youngstown 1, Ohio.*

Item E173

Anti-Siphon Oil Valve

NAME — Preferred Utilities' anti-siphon valve, Type A.
PURPOSE—An angle type anti-siphon valve for use with No. 6 or lighter grades of fuel oil.

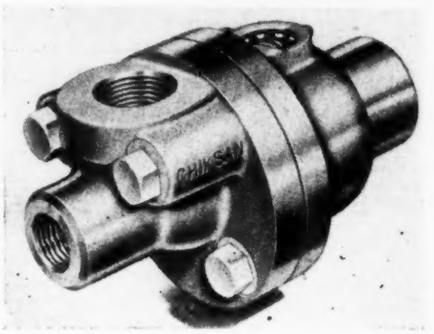


FEATURES — This valve, which has been approved by the Underwriters' Laboratories for No. 6 oil, is said to be the only valve available in 1¼, 1½ and 2-inch sizes for operating under head pressures of 5 or 10 ft. The valve permits the pumping of fuel oil, but in the event of a break in the suction line, it prevents siphoning of oil.
MADE BY — *Preferred Utilities Manufacturing Corp., 1860 Broadway, New York, N. Y.*

Item E174

Chiksan Joint

NAME—Chiksan high temperature rotating joint.
PURPOSE—Pipe joint designed to handle a maximum pressure of 15 lb steam at rotating speeds from 150 to 300 rpm.
FEATURES—A ring of stainless steel balls permits easy turning; a positive, long-life seal is used which, it is claimed, is not affected by corrosion, contamination, or temperature changes. Sealing surfaces have a hard chrome plating for long wear. Cadmium plating is used inside and out as protection against corrosion. The unit is said to be



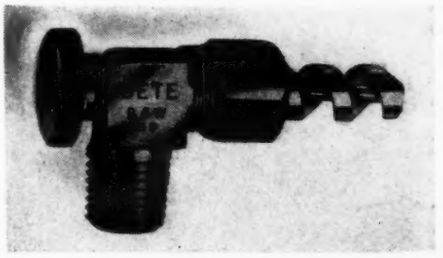
effective equally in constant or intermittent service.
SIZES AND CAPACITIES—Available in 1-, 1½-, and 2-inch sizes.
LITERATURE AVAILABLE—Bulletin.
MADE BY—*Chiksan Co., Brea, Calif.*

Item E175

Bete Spiral Nozzle

NAME—Bete spiral nozzle.
PURPOSE—Nozzle to develop a wide angle of spraying.
FEATURES—Nozzle which provides unusually wide angle sprays was designed for low flow rates and operates at low pressures. Nozzle will produce fine and uniform drop sizes with a 180 deg. umbrella spray pattern of wide coverage. Due to its spiral design, unit is said to be relatively non-clogging and can be easily cleaned on the job by means of a removable pin. The pin itself is interchangeable to provide for different flow rates.
SIZES AND CAPACITIES — Available in two sizes for ½ to 2 gpm and 1½ to 4 gpm.
MADE BY—*Bete Fog Nozzle Co., Greenfield, Mass.*

Item E176



Solving STEAM TRAP PROBLEMS

all your questions answered about CORRECT STEAM TRAPPING

How can I select the right trap for any installation?

Why is it important to trap unit heaters?

How many fittings can I save per installation?

What is flash steam?

● Here's a book especially prepared to answer all your questions about correct trapping of steam lines. Filled with helpful data, "Solving Steam Trap Problems" saves time and money by giving easy-to-follow formulas for proper trap selection. Contains many hints on how to keep equipment at top efficiency by removing all condensate and air, as well as how to install and service traps. This valuable book is yours without cost. Mail coupon today.

SUPER-SILVERTOPS
SAVE YOU MONEY
use in-line or as an elbow

THE V. D. ANDERSON COMPANY
1992 West 96th Street • Cleveland 2, Ohio

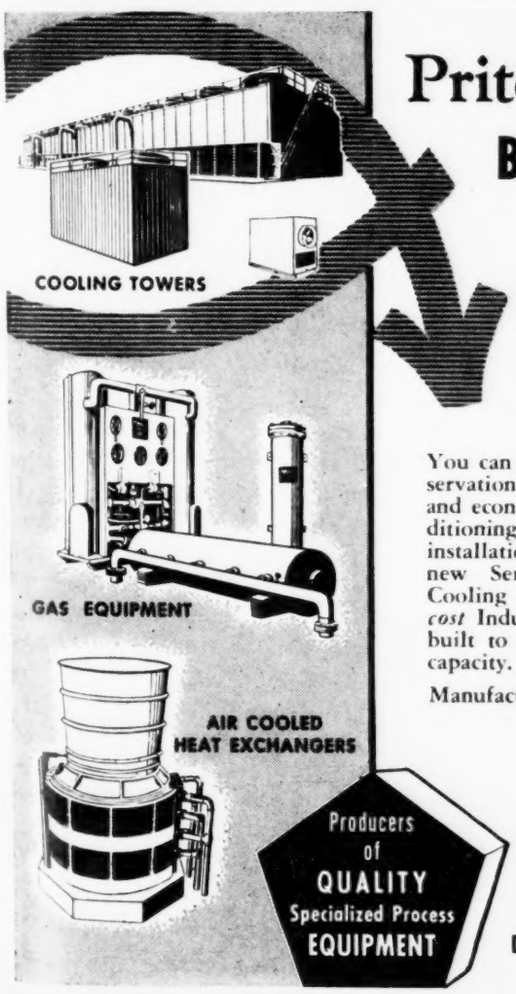
Gentlemen: Please send without obligation your book, "Solving Steam Trap Problems."

Name .....

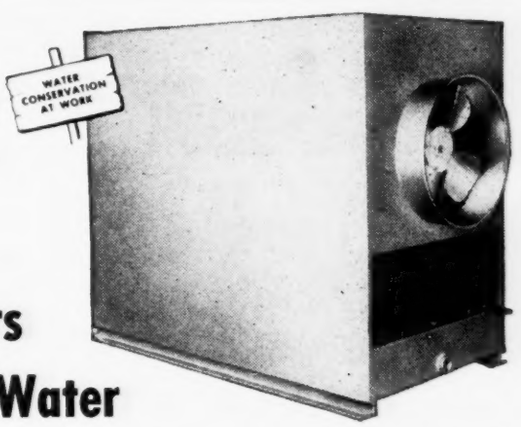
Address .....

City ..... *State* .....

In Canada: Bowden Machine Co., Toronto



Pritchard's *NEW,* Better-Than-Ever Packaged Cooling Towers Help You Save Water



You can now put water conservation to work efficiently and economically on air conditioning and refrigeration installations with Pritchard's new Series "P" Packaged Cooling Towers. This *low cost* Induced Draft Tower is built to give up to 20 tons capacity.

Manufactured of highest quality materials, the Series "P" tower is shipped either "knocked down" or shop assembled, and is available in painted steel, stainless steel or aluminum. Easily installed. Protect our natural resources. Prevent water wastage!

Wherever you see a Pritchard Cooling Tower, you see water conservation at work!

Write for FREE Bulletin No. 5.6.082.

EQUIPMENT DIVISION
J.F. Pritchard & Co.
Dept. No. 16 — 908 Grand Ave., Kansas City 6, Mo.

District Offices: Chicago • Houston • New York • Pittsburgh • Tulsa • St. Louis
Representatives in Principal Cities from Coast to Coast

New! Kennametal Masonry Drill

ZIPS through cement, brick, slate, marble

New trouble-free drill works in any direction, goes to any depth (up to 10 inches), drills faster . . . can save on time and cost.

New Kennametal "twist-type" masonry drill keeps drilling with no "time-out" for hole cleaning. Spiral flutes clean cuttings back as fast as they form. Drill operates easier, requires less power and push.

Super-tough Kennametal cemented carbide cutting edge resists wear, stays sharp — UP TO 100 TIMES AS LONG.

Buy Kennametal drills at your supply house.

Gets Money-Saving RESULTS!

"50 holes, ½ inches deep in tile, per grind. Speed — 40 seconds per hole."

"Average 100 holes, 3½" deep in cement between regrinds. Speed — 15 seconds per hole."

"Saved 7½ hours in one day with one drill. Saved money — had easier going."

Be set for any job with handy unit of assorted drill sizes. Kit holds ¼", 5/16", ⅜", ½" and 9/16". Tough plastic case resists water and oil.

Convenient carton of six drills of one size keeps a sharp drill always handy. Drills lift as top opens.

If your supply house cannot supply you, write:

KENNAMETAL Inc., Latrobe, Pa.

Please send me FREE Kennametal Folder K-109 showing 26 different drill sizes, two different drill styles, and complete details on masonry drilling.

Name .....

Address .....

City ..... State .....

KENNAMETAL ®

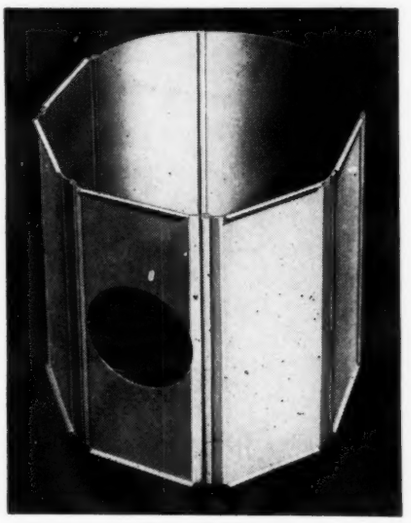
WORLD'S LARGEST MANUFACTURER OF CEMENTED CARBIDE DRILLING TOOLS

Stefco Combustion Chamber

NAME—Stefco stainless steel combustion chamber.

PURPOSE—Combustion chamber for oil burners.

FEATURES—The pear-shaped combustion chamber is made of heat resistant stainless steel to conform more closely to the flame pattern of nozzles currently used on oil burners. Makers also claim that the shape of this chamber provides better heat distribution and higher efficiency.



SIZES AND CAPACITIES — Available in three widths and twelve lengths. For use with burners of capacities from 1 to 3 gph.

MADE BY—*Stefco Steel Company, Michigan City, Ind.*

Item E177

Relative Humidity Indicator

NAME — Relative humidity indicator.

PURPOSE — For determining per cent of relative humidity by means of a color indicator.

FEATURES—Color of card changes in accordance with the per cent humidity present in the air and when this color is compared with a standard chart, a reading within the range of 20 to 70% relative humidity can be obtained which, the makers claim, is within 5% of the true reading. It is quickly reversible and will not dust or release hard particles. Unless wetted, it has a long life.

MADE BY—*Humidial Company, 864 Edgehill, Colton, Calif.*

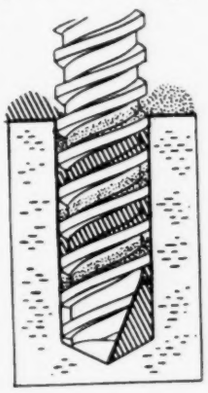
Item E178

Cyclo-Twist Drill

NAME—Cyclo-Twist.

PURPOSE—Carbide tipped rotary drill bit for use in masonry with a built-in dust-lift feature.

FEATURES—Two spiral low angle flutes are turned in the steel drill body. The diameter of the body is the same as the hole to be drilled and provides maximum steel support for the carbide tip. Makers claim that the design of the drill removes the dust from the hole as it is formed by the drill.



SIZES AND CAPACITIES—Available in sizes from 3/16 to 1 inch, inclusive.

MADE BY—*New England Carbide Tool Company, Cambridge, Mass.*

Item E179

Titus Grille

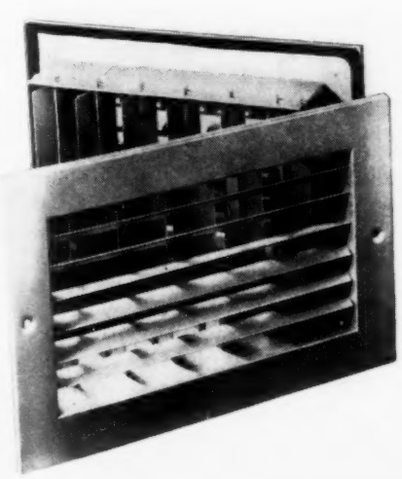
NAME — Titus combination grille and volume controller.

PURPOSE — Combination unit for controlling air distribution.

FEATURES—Volume controller and distribution grille are contained in one compact unit. Just two sets of louvers control both air volume and distribution. The new unit, it is claimed, is more economical, light in weight, and easy to install. Adjustments can be made in little time.

MADE BY—*Titus Manufacturing Corp., Waterloo, Iowa.*

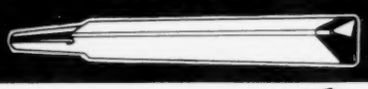
Item E180



New! Kennametal Tri-Point Rock Drill

HAMMER DRILLS—
Granite, Hard Concrete, Sandstone, Hard Limestone

One of the greatest of all drill developments. Drills ANY nonmetallic. FAST and POWERFUL in rock.



Money Saved with ROCK Drills

Francis M. Neighly reports: "On foundations, granite slabs, and hard marble floors, Kennametal Tri-Point ROCK drills have saved me days of hard drilling and plenty on cost."

J. L. Purdy says: "We drilled 30 holes through a 5 inch slab of hard concrete in less than one hour."

New Kennametal Tri-Point ROCK drill hammers through the most abrasive sandstone, concrete aggregate, and HARD ROCK. Brute Strength enables it to take terrific poundings, shocks and impact.

Its wear-resistant Kennametal cutting edge stays sharp up to 100 times as long — gives up to 30% faster drilling speed. Diameters are 3/8" to 1"; lengths, 7¾" and 12". Buy money-saving Kennametal Tri-Point ROCK Drills at your supply house.

Use to: Anchor Machinery Install Conduits • Cut Stone • Install Parking Meters Fasten Signs, Doors.

Sets of one size in handy box of "pull-out" construction.

If your supply house cannot supply you, write:

KENNAMETAL Inc., Latrobe, Pa.

Please send me FREE Kennametal Folder K-111 showing how ROCK drilling is done at a saving of time and money and also complete particulars on the Kennametal Tri-Point ROCK drill.

Name.....

Address.....

City..... State.....

KENNAMETAL®

WORLD'S LARGEST MANUFACTURER OF CEMENTED CARBIDE DRILLING TOOLS

WHAT READERS SAY

Boiler in Levitt and Sons' Homes

EDITOR, HEATING AND VENTILATING:

In the article, "Designing the Heating System for the Development-Type House," by I. G. Jalonack in the March 1950 issue of HEATING AND VENTILATING, please explain the function of the cross connection from the floor coil supply line to the bottom of the boiler as shown in the diagram on page 53. It is difficult for me to understand how the floor coils receive any flow at all. The normal action would be a flow from the top of the boiler through the circulator and back into the boiler. The outlet to the circulator appears to be at the top of the water. On a cold start, this opening will be in air, rather than water.

As the author states that this boiler is a standard unit that is available in the open market, who are the manufacturers. *J. L. B.*

Indianapolis, Ind.

In reply to this query, Mr. Jalonack supplied the following information:

"The diagram would have been clearer if information on pipe sizes had been included. Although the line feeding the floor coils is ¾ inch nominal, the size of the tube pulling water from the boiler is, in our case, ⅜ inch. Thus, about one gallon of very hot water is pulled from the boiler and mixed with about three gallons of recirculated water. This yields a mild coil temperature and, at the same time, keeps water circulating through the boiler. The water circulating through the boiler causes the aquastat to respond quickly, and yet the amount of water going through the boiler is small enough so that the water temperature is maintained sufficiently high to furnish domestic hot water.

"The outlet from the boiler is actually slightly below the air chamber. This does not show clearly on the single line schematic sketch. The automatic air eliminating valve insures that there will always be water at the pipe exit level.

"Both the General Electric Co., Bloomfield, N. J., and York-Shipley, Inc., York, Pa., make this unit."

Getting Personal

M. Freund

Mortimer Freund (*Standpipes for Fighting Fires in Multi-Story Buildings*, page 69) is a native New Yorker who received his E.E. degree from the School of Engineering, Columbia University. Immediately following graduation he served as a student-apprentice in the East Pittsburgh works of the Westinghouse Electric Corp., and after this in the office of the civil engineer at the U. S. Navy Yard, Brooklyn, N. Y., where he inspected installations and tested materials. He next joined the staff of a consulting engineer in New York and had responsible charge of the design and supervision of the installation of all branches of engineering work in buildings, including heating, ventilating, plumbing, automatic sprinkler and electric systems.

In 1914, together with J. G. Eadie and J. K. Campbell, he formed the consulting engineering firm of Eadie, Freund & Campbell, with offices in New York City. It is still engaged in engineering for all types of buildings, including industrial plants, housing projects, hotels, institutional and commercial buildings. This firm has helped develop the design of fire-fighting systems, especially for very tall buildings.

During World War I, Mr. Freund served as mechanical engineer at large in the Ordnance Department, Washington, D. C.

He is a member of the American Institute of Electrical Engineers, The Illuminating Engineering Society, the New York State and National Societies of Professional Engineers and a past-officer of the New York Association of Consulting Engineers. He is also a member of the Society of the Sigma Xi.

J. J. Sefing

John J. Sefing (*Air Conditioning and Ventilating the Theater Projection Room*, page 51) attended the Pennsylvania State College where he majored in mechanical engineering.

For the past 20 years he has been connected directly or indirectly with the design and construction of theaters; and the design, installation and maintenance of equipment for theaters. At present, Mr. Sefing is an engineer associated with a company engaged in the manufacture of theater arc lamps.

He is a member of the Society of Motion Picture Engineers, Armed Forces Communication Association, and the American Association for the Advancement of Science. Mr. Sefing has written a number of articles for technical societies and publications.

M. Sheinbaum

Milton Sheinbaum (co-author, *Tailpipe Exhaust Systems for Garage Ventilation*, page 65), has been an industrial engineer, Division of Industrial Hygiene and Safety Standards, New York State Department of Labor since 1946. Born in New York, he graduated from the Polytechnic Institute of Brooklyn with a bachelor of chemical engineering degree. He worked on several experimental engineering projects for the Supreme Laboratory in Newark, N. J., and for the Anglo-Chilean Nitrate Company in New York. This was followed by a year with the United States Public Health Service and 3½ years with the United States Army in sanitary engineering and industrial hygiene.

Directly after the war he accepted a position with the New York State Department of Labor where his work covers the entire gamut of industrial hygiene engineering. He is a member of the American Industrial Hygiene Association.

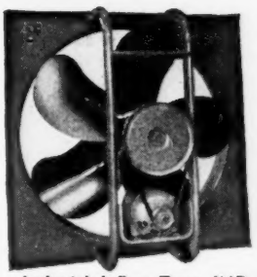
Arthur C. Stern (co-author, *Tailpipe Exhaust Systems for Garage Ventilation*, page 65), has been chief engineer, Division of Industrial Hygiene and Safety Standards, Department of Labor since 1942. He is a native of Petersburg, Virginia, and a resident of Rockville Centre, Long Island. His biography was published in the November, 1946 issue of HEATING AND VENTILATING.

—Over 150 different sizes and models!

CHELSEA FANS

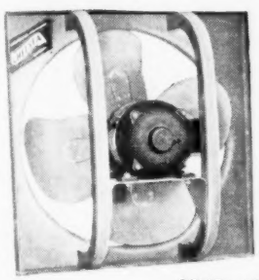
—FOR EVERY INDUSTRIAL AND COMMERCIAL NEED!

There's a CHELSEA fan for every requirement—each type certified for performance in accordance with the Standard Code of the Propeller Fan Manufacturers Association.



Industrial Fan Type IND
For large general area ventilation. Moves large volumes of air under pressure. Sizes from 24" to 60".

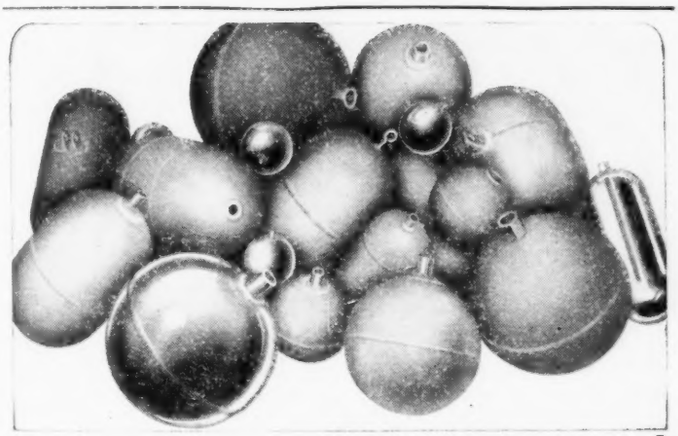
All-Purpose Fan Type BB
For removing smoke, steam, heat, fumes, etc. Heavy duty, direct drive fan for continuous operation. Recommended for use against static pressure and in duct work. One piece panel and orifice, lightweight, simple to install. Sizes from 10" to 30".



Spin-It-Fans—16" and 22"
A new idea in window fans—reversible for drawing-in or exhausting air. Two speed, for cooling and ventilating, and subsequent operation.

SEND FOR YOUR FREE KIT!
Contains all the information you need to make ventilating installations in factory, store, office or home. Write for yours today—Address Dept. N.

CHELSEA FAN & BLOWER CO., INC.
1206 GROVE ST., IRVINGTON, N. J.



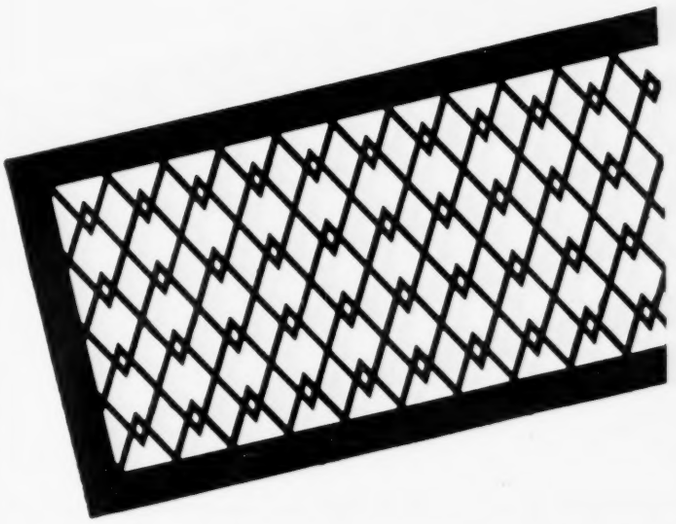
Send for Nicholson

FLOAT BULLETIN 348

Complete Data on Welded Floats: Diagrams, Tables, Formulae for Calculation of Buoyancies

The booklet is a standard reference for specifiers of welded floats. Nicholson furnishes any type: for external or internal pressures; in stainless steel, Monel, chromium, cadmium or copper-plated steel. Sizes, 2" to 14" diam.; press. to 4,800 lbs; standard or special connections. 2-day delivery on many sizes and shapes. Nicholson floats are standard with hundreds of manufacturers.

W. H. NICHOLSON & CO. 199 OREGON ST. WILKES-BARRE, PA.



To harmonize with any decorative motif

there's a choice of over 100 standard Hendrick Grilles

Ornamental grilles are usually the largest and most conspicuous article of hardware in a room. Consequently, their appearance is a prominent factor in the decorative scheme.

To suit any requirements Hendrick Grilles are made in a large variety of attractive and distinctive designs. Each can be supplied in a wide range of overall dimensions, bar sizes, number of perforations and size of perforations. Ample open areas assure good air flow.

Hendrick Grilles are fabricated in accurate sizes, with clean-cut perforations and with no burrs or other imperfections, in heavy-gauge aluminum, bronze, copper, Monel, steel and stainless steel.

They are easy to install, and always lie flat because of a special flattening operation in their manufacture.

The grille illustrated is design M No. 9, which has 67% open area. Write for detailed information.

See Our Catalog in SWEET'S

Perforated Metals
Perforated Metal Screens
Architectural Grilles
Mitco Open Steel Flooring,
"Shur-Site" Treads and
Armorgrids

HENDRICK
Manufacturing Company
42 DUNDAFF STREET, CARBONDALE, PA.
Sales Offices in Principal Cities

. . . Since the Last Issue

A number of executive promotions were made by the board of directors of **Wagner Electric Corp.** in their first meeting held Tuesday, March 21, 1950, following their e'ection at the annual stockholders meeting which occurred the previous day. **P. B. Postlethwaite,** who has been president of the company and chairman of the executive committee for the past twenty-four years, retired as president at his own request, and was elected to the newly created office of chairman of the board. He will continue as chairman of the executive committee. **J. H. Devor,** who has been vice president since 1941, was elected president. **H. N. Felton,** manager of the St. Louis sales branch, was elected vice president in charge of sales. **L. W. McBride,** credit manager, was elected assistant secretary-treasurer to succeed **A. K. Bahret** who has reached retirement age after fifty years with the company.

P. B. Postlethwaite

J. H. Devor

Mr. Postlethwaite started with Wagner in 1909 as a student apprentice after graduating from college with a BS degree in electrical engineering. Upon completion of his student engineering training, he was transferred to the Cincinnati sales office and became manager of that office in 1912. He held various positions in the home office and in the early 1920's, following organization changes, he was named vice president and elected to the board of directors. He was elected to the presidency in July of 1926.

Mr. Devor graduated from college in 1912 with a BS degree in electrical engineering. In the fall of that same year, he joined Wagner as a student apprentice. He spent the following six years in various branch offices, and in 1920 he was transferred to the home office in St. Louis and appointed supervisor in charge of all service branches. He was appointed to the position of assistant vice president in 1933, became vice president in 1941 and was elected to the board of directors in 1945.

L. W. McBride

H. N. Felton

L. W. McBride began his career with the Wagner company in 1922 when only eighteen years of age. Starting in the factory, he worked for two years in the special and service parts department, and then moved to the office service division. In 1925 he was transferred to the accounting department, and two years later to the treasury department. During these years Mr. McBride had been attending night courses at the School of Commerce and

design

MAKES ALL THE DIFFERENCE IN WELDING TEES, TOO

When seamless drawn welding tees were introduced some 17 years ago, they represented a great advance over cut-and-welded intersections. Even so, they still had certain inherent weaknesses. Their design was unstable under high internal pressure and bulging resulted at the flat spots of the side walls. The relatively weak crotch area, carrying an unequal share of the load, usually gave way first in bursting tests. To compensate, tees were made excessively heavy.

Tube Turns research engineers developed a new welding tee design based on the sphere, nature's strongest form for resistance to internal pressure. This shape, with necessary modifications, became the basis for an entirely new welding tee design.

In the Tube-Turn barrel-type tee, the internal pressure load is carried largely in direct tension. And, in bursting tests involving the old and new design, it proved capable of withstanding 22% more pressure before yielding. It is at least 25% stronger than the code (ASA B16.9) requires, as evidenced by these test results on 6" tees:

	BURSTING PRESSURE	
Schedule	ASA B16.9 Required	Test Minimum
40	4440 psi	5950 psi
80	6845 psi	8625 psi

Result of typical hydrostatic bursting test conducted in the Tube Turns research laboratory. The pipe itself split wide open under the terrific pressure applied; the new Tube-Turn welding tee is undamaged. Micrometer checks reveal no evidence of yielding or distortion.

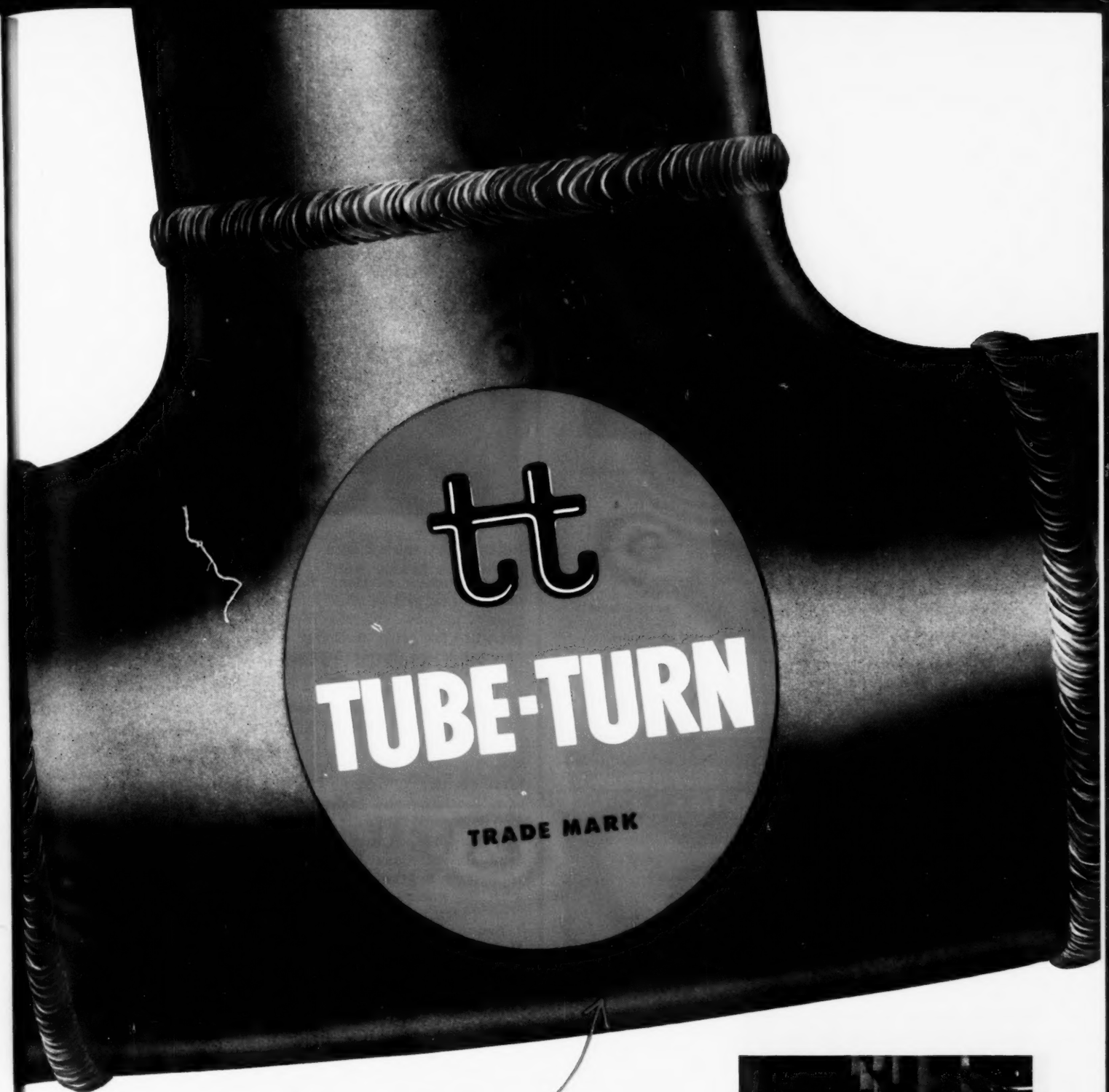
FREE BOOKLET

Write for your free copy of "Research", a booklet reporting results of cyclic tests being conducted by Tube Turns engineers on the fatigue life of piping assemblies. Well illustrated. Contains valuable information on relative fatigue life of welding elbows, mitre bends, various types of flanges.

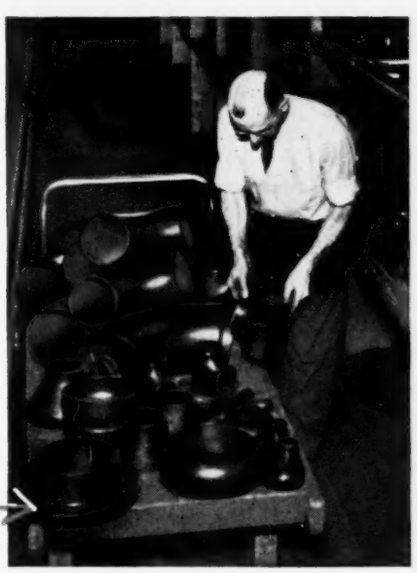
"Be Sure You See The Double tt"

TUBE TURNS, INC.

LOUISVILLE 1, KENTUCKY



In all the world there's only one TUBE-TURN Welding Fitting as shown by this trade mark... the right mark for every need in welding fittings and flanges.



Your nearby TUBE TURNS distributor can serve you right from stock. Call him for prompt delivery.

TUBE TURNS, INC., LOUISVILLE 1, KENTUCKY DISTRIBUTORS IN ALL PRINCIPAL CITIES

DISTRICT OFFICES: NEW YORK • PHILADELPHIA • PITTSBURGH • CHICAGO • HOUSTON • TULSA • SAN FRANCISCO • LOS ANGELES

In Canada . . . Tube Turns of Canada Limited, Chatham, Ontario

MERCOID

AUTOMATIC CONTROLS FOR HEATING, AIR CONDITIONING, REFRIGERATION AND VARIOUS INDUSTRIAL APPLICATIONS

THE ONLY 100% MERCURY SWITCH EQUIPPED CONTROLS

The distinguishing feature of Mercoid Controls is the exclusive use of Mercoid hermetically sealed mercury switches. These switches are not subject to dust, dirt or corrosion, thereby assuring better performance and longer control life. The items shown below are but a few miscellaneous items. See Catalog No. 700 for the complete line.

Pressure Controls

Temperature Controls

Float Operated Controls

Transformer-Relays

Low Voltage Thermostats

Line Voltage Thermostats

Liquid Level Control

Oil Burner Safety and Ignition Controls

If you have a problem involving the automatic control of pressure, temperature, liquid level, mechanical operations, etc., it will pay you to consult Mercoid's engineering staff — always at your service.

Manufacturers of Dependable Automatic Controls for Over A Quarter of A Century

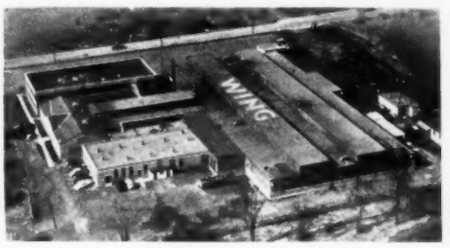
THE MERCOID CORPORATION • 4223 BELMONT AVE. CHICAGO 41 • ILL.

AIR-FLO
AUTOMATIC
CEILING SHUTTER
FOR ATTIC FAN
Built so they can be installed practically flush with the ceiling, AIR-FLO Ceiling Shutters present a refined, finished appearance. Their natural aluminum color blends with any decoration, eliminating need for painting, and no grille or winter cover is required. Furnished in 5 different widths, single panel up to 73" long. No operating mechanism shows. Built-in fusible link. Meets fire underwriters requirements.
WRITE FOR NEW CATALOG 43-F
Illustrations and details of the complete AIR-FLO line.
AIR CONDITIONING PRODUCTS CO.
2340 W. LAFAYETTE BLVD. • DETROIT 16, MICH.

Finance of St. Louis University, and was graduated in 1927.

H. N. Felton graduated from college in 1917 with a BS degree in electrical engineering. After serving two years in the United States Army, he began his career with the Wagner company in 1919 as a student apprentice. Since 1941 he has been manager of the St. Louis branch sales office.

H. S. Wheller, president of **L. J. Wing Mfg. Co.** describes the purpose of the new Wing factory at Linden, N. J., as to provide additional space for manufacture of the company's line of unit heaters, steam turbine drives,



New Wing Factory

H. S. Wheller

process heater sections, fans, blowers, and industrial fog eliminators, and to effect closer interdepartmental cooperation. The new building represents consolidation of three separate factories, formerly in Newark, and the company's general offices, formerly located in New York. A New York City sales office will be maintained at 154 W. 14th St. to handle local sales.

Douglas M. Considine has been appointed manager of the market extension division, general sales, of **Brown Instruments** division of the **Minneapolis-Honeywell Regulator Co.** Mr. Considine's new duties will include direction of advertising and technical and trade editorial activities. He will continue as technical editor of Instrumentation, Brown's house-trade publication. Mr. Considine is a graduate of Case Institute of Technology and holds a bachelor's degree in chemical engineering. He has been with the company since 1941.

A. G. Zumbrun

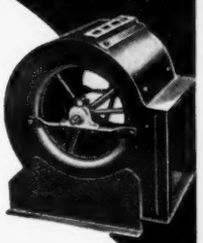
Brunner Manufacturing Co., Utica, N. Y., has announced the election of **A. G. Zumbrun** as president following the resignation of **G. L. Brunner, Jr.**, from that post. Mr. Zumbrun joined the Brunner organization as an auditor in 1925 and was elected treasurer in 1933, a position he still holds. He became vice president and general manager in December 1946, and in April 1947 became chairman of the board and executive vice president when G. L. Brunner, Sr. retired. In resigning his connections with the Utica company, G. L. Brunner, Jr. stated this became necessary as the management of Brunner Corporation (Canada) Ltd. will require his full time, he having come into control through the death of his father, G. L. Brunner, Sr., last October 29th.

Cecil H. Gay, works manager of the Barberton plant of **The Babcock & Wilcox Co.**, has been elected vice president. Mr. Gay, who joined the company after graduation from the University of Nevada in 1928, has been connected with the Barberton operations since 1932.

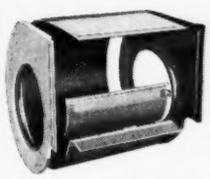
McQuay, Inc., announces the appointment of **S. T. Carlson** as district factory representative to handle the company's complete line of heating and air conditioning products in Iowa, with the exception of the southwestern corner, in addition to the northwestern counties in Illinois. His office address is 1002-1003 Bankers Trust Building, Des Moines 9, Iowa.

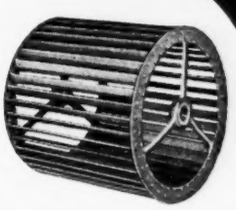
MASSACHUSETTS

BLOWERS



Air Conditioning Furnace Blower Assembly. Designed for manufacturers of warm air furnaces and Air Conditioning equipment. Wheel Sizes 7½" to 27"





Housing Sides—Cutoff Plate and scroll Sheet.

Heavy gauge steel stampings.

End Spider suspension type wheel assembly.

Write for catalogs.

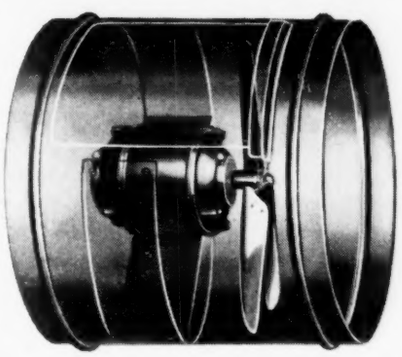
MANUFACTURERS OF CENTRIFUGAL BLOWERS FOR 35 YEARS

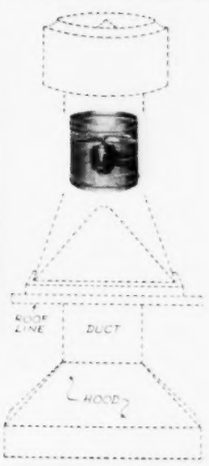
MASSACHUSETTS BLOWER DIVISION

The BISHOP & BABCOCK Mfg. Co.

4901 HAMILTON AVENUE — CLEVELAND 14, OHIO

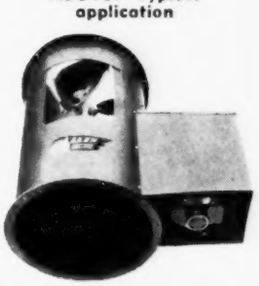
Allen STAXAUSTER





ABOVE: Typical application

Simple, compact, sturdy unit for the conversion of all types of roof ventilators into powerful EXHAUST OR AIR SUPPLY UNITS. Can be combined readily with various stack heads (Allen or other makes) to meet a wide range of needs. Centered fan and motor assembly staunchly supported by inner steel band. Motor completely enclosed, directly connected to propeller. Ample-size inspection door. Remote Drive Allen Staxauster (right) specially designed for applications handling corrosive fumes, high temperature air —motor and belt drive completely isolated from air stream. Write for complete catalog of roof ventilators.



SEE OUR CATALOG IN SWEET'S

Representatives in most principal cities.

ALLEN VENTILATOR DIVISION
PRODUCTION PLANNING COMPANY
Rochester, Michigan

CAUTION

TO VENTILATOR BUYERS

If you want to *be sure* of what you're getting when you buy ventilators, insist on *certified* capacity ratings based on tests made with wind blowing in *all* directions, as indicated below.

The First Scientific Improvement in Ventilators in over 50 Years!

Breidert Air-X-Hauster Type B

Only such tests can guarantee the capacities a ventilator will deliver under actual operating conditions! Don't be misled into buying on size alone. Insist on the correct size for the capacity required.

The Breidert Air-X-Hauster has been tested by Smith, Emery & Co. of San Francisco, Pacific Coast branch of the Pittsburgh Testing Laboratory, with wind directed at *all* angles shown above. It is the *only* ventilator on the market with published certified ratings based on such tests. Breiderts are extensively used on industrial, commercial and residential buildings all over the country, and on most types of pleasure craft and ships.

For detailed information and free Engineering Data Book on the Breidert, send the coupon.

G. C. BREIDERT CO.

3129 San Fernando Road • Los Angeles 65, Calif.

REPRESENTATIVES IN PRINCIPAL CITIES OF THE UNITED STATES

G. C. BREIDERT CO., Dept. V
3129 San Fernando Road
Los Angeles 65, Calif.

☐ Send name of nearest Breidert representative.
☐ Send Free Engineering Data Book and other literature.

Name.....
Company.....
Street.....
City.....Zone.....State.....

Industrial Sound Control

QUIETS

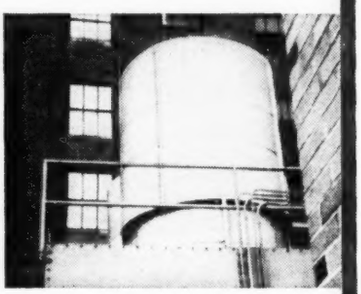
COOLING TOWERS

in Air Conditioning Installations

Ends

- **ANNOYANCE**
- **COMPLAINTS**
- **THREATS OF LEGAL ACTION**

due to disturbing noise



Now your new or existing air-conditioning installations can be made *whisper-quiet*, to comply with every city ordinance. ISC can solve the noise problem quickly, inexpensively. Investigate today.

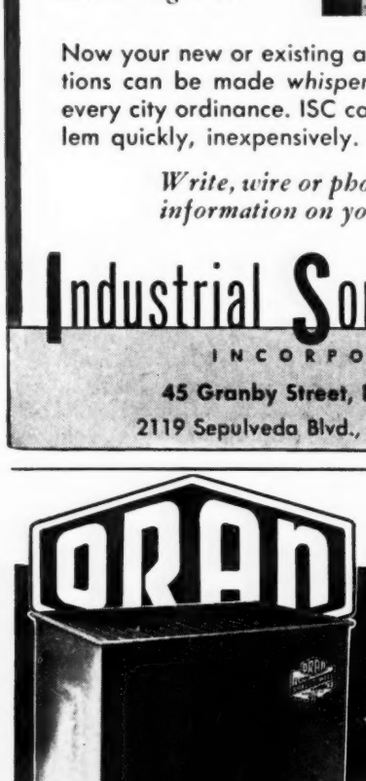
Write, wire or phone us for full information on your problem

Industrial Sound Control

INCORPORATED

45 Granby Street, Hartford, Conn.

2119 Sepulveda Blvd., Los Angeles, Calif.



SHALLO-WELL

OIL-FIRED FLOOR FURNACES

ONLY **34** INCHES DEEP

BTU CAPACITIES OF

★ 50,000 ★ 65,000 ★ 75,000

Write for Details!

ORAN

UNDERWRITERS' APPROVED

ORAN COMPANY

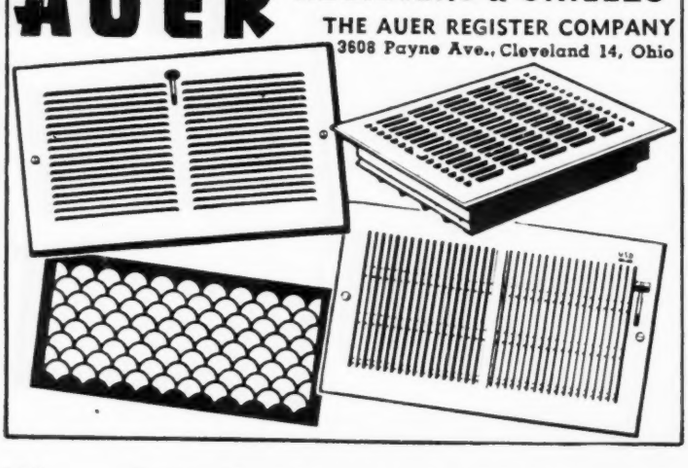
2226 S. THIRD STREET

COLUMBUS 7, OHIO

AUER **REGISTERS & GRILLES**

THE AUER REGISTER COMPANY

3608 Payne Ave., Cleveland 14, Ohio



Appointment of **W. H. Evans** as vice president and director of **Minneapolis-Honeywell Regulator Company, Ltd.**, Leaside, Ontario, has been announced. Mr. Evans will continue in his position of general manager of the company. He joined the company in 1931 as accountant and office manager. In 1938 he was appointed assistant general manager and three years later he became general manager.

Buensod-Stacey, Inc., announces the opening of a branch office in the Dixie Building, Room 418, Greensboro, N. C. **M. L. Eakes**, formerly of the Charlotte office, will be in charge of the Greensboro office.

Appointment of **Robert C. Cross**, assistant manager of Merchandise Laboratories, Sears, Roebuck & Co., Chicago, as chairman, and **Richard S. Dill**, chief, heating and air conditioning section, National Bureau of Standards, as vice chairman of the committee on research of **ASHVE** has been announced. The committee on research plans and supervises the ASHVE research program at its laboratory in Cleveland and at cooperating colleges and universities where the society has made a grant of funds. Appointments have been approved by the society council.

E. J. McFadden has been appointed manager of the water heater, range boiler and soil pipe department of **Combustion Engineering-Superheater, Inc.** Mr. McFadden succeeds James R. Hedges, who is retiring after 31 years' service as head of the department. Mr. McFadden was formerly general sales manager of the department. Prior to joining Combustion, he was sales manager of the water heater division of General Electric Co.

C. R. Boyer has been appointed production engineer, and **L. F. Green**, assistant production engineer, of **Dravo Corp.**, Pittsburgh. Mr. Boyer, a graduate of Carnegie Institute of Technology, has been with Dravo since 1936. He also is head of the company's cost engineering department. A graduate of Case Institute of Technology and Lehigh University, Mr. Green joined Dravo in 1941.

McQuay, Inc., announces the appointment of **Randall S. Stover** as district factory representative located at Room 502, 1424 K St., Washington, D. C.

W. O. Brown, Crane Co., branch manager at Richmond, Va., has been promoted to manager of the plumbing department, general office, Chicago, Ill., succeeding **George E. Hoffman**, who is retiring after many years of service. Mr. Brown has served the company in various capacities since 1930. He started as a salesman in the Washington, D. C., branch and in 1943 was made assistant manager; in 1946 he was transferred to Richmond, Va., as manager.

Herbert A. C. Smith has recently been added to the staff of **Alco Valve Co.** as field engineer. His territory, with headquarters in Philadelphia, will include Eastern Pennsylvania, and Southern New Jersey, the States of Delaware, Maryland, and Virginia, and the District of Columbia.

Fairbanks, Morse & Co. has announced election of two new vice presidents. These are **O. O. Lewis**, vice president in charge of sales, and **F. J. Heaslip**, vice president in charge of purchases and traffic.

Appointment of **Richard A. Biggs** as director of architectural development for **Crucible Steel Co. of America** has been announced. Formerly development engineer of Pittsburgh Corning Corp., Mr. Biggs makes the headquarters of his countrywide Crucible activities in New York.

Dravo Corp. has been awarded a contract to air condition the first of Pittsburgh's new skyscrapers. The contract covers the complete air conditioning, heating and ventilating of the 40-story structure now under construction at 525 William Penn Place. It will be the first large office building in Pittsburgh to be completely air conditioned.

Mullins Engineering Co., Little Rock, Ark., has been appointed distributor in Arkansas for **Bryant Heater Division, Affiliated Gas Equipment, Inc.**, Cleveland, Ohio. Mullins engineering will be the sole distributor in that area for the full line of Bryant equipment.

Marsh Heating Equipment Co., sales affiliate of Jas. P. Marsh Corp. has appointed **Marcus-McCauley and Associates**, 239 Fourth Avenue, Pittsburgh, as their representatives in the Pittsburgh territory. **Kress Engineering and Sales Co.**, Grand Rapids, has been appointed Marsh representative for the western half of Michigan. Both are handling the company's complete line of heating specialties and controls.

George F. Gebhardt, 76, former director of the department of mechanical engineering at Illinois Institute of Technology, died at 8:30 a. m., March 22, at his home in Miami, Florida. Professor Gebhardt was a member of the faculty of Armour Institute of Technology (now Illinois Tech) from 1898 until his retirement in 1934. He is author of two books, Combustion (1925) and Steam Power Plant Engineering (1927).

Robert Barnes Dickson, president and director of the **Kewanee Boiler Corp.** and a member of the board and the executive committee of the American Radiator & Standard Sanitary Corp., died in Kewanee, Ill., April 9. He was 67.

Mr. Dickson had been associated with the Kewanee Boiler Corp., a division of American-Standard, for almost 45 years, and was a prominent figure in the field of heating.

He was born in Streator, Ill., January 13, 1883. After high school he held two minor positions in Galva, Ill., and then, in May, 1905, he became a bookkeeper for Kewanee Boiler Company. Mr. Dickson later served as salesman, branch manager, vice president and general manager of sales. In 1930 he was named president and director.

Mr. Dickson's business interests outside Kewanee Boiler and American-Standard included Emerit E. Baker, Inc., of Kewanee, of which he was a vice president and director.

He was a member of the ASME, and a life member of ASHVE.

The **New York Blower Co.**, has announced the appointment of A. A. Maycock Co., 234 Seventh Ave., Salt Lake City, Utah, as their representative in that area.

The **Sturtevant Division** of the **Westinghouse Electric Corp.**, Hyde Park, Boston, Mass., announces the realignment of its sales organization by the formation of two new departments: one to concentrate on sales of air conditioning products; and the other, air handling equipment. Newly appointed manager of the air conditioning sales department is **T. E. Smith**, and manager of the air handling sales department is **Phillip Cohen**. Both departments will be under the supervision of **J. C. Thompson**, general sales manager.

The Rittling Corp., manufacturers of baseboard heating, unit heaters and other finned tube radiation equipment, Buffalo, New York, announces the appointment of the newly formed **Paul Thompson and Co.**, 231-47 North Third St., Philadelphia 12, Pa., as sales and warehousing representatives in eastern Pennsylvania, southern New Jersey, Delaware, Virginia, District of Columbia and Maryland. Sales representatives will be located in Harrisburg, Philadelphia, and Baltimore. The Thompson organization will maintain a complete engineering department for servicing and layout, which will be available to architects, wholesalers and heating contractors.

Tube Turns of Canada Ltd., has announced the appointment of **Arthur H. Brodie** as district manager. Mr. Brodie's headquarters will be at the company's plant in Chatham, Ontario, but he plans to spend considerable time in Toronto, where he makes his home

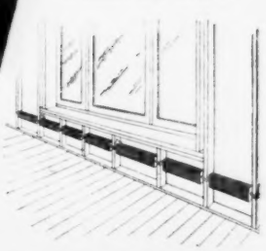
INVISIBLE RADIANT HEATING

KRITZER "FIN-TUBE" RADIANT COILS

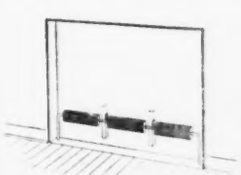
for the NEW economical RADIANT HEATING!

Thousands of installations have now proved the amazing advantages of Kritzer Radiant Coils from the important standpoint of heat transfer and especially the practical economy of both materials and labor. For better installations, for more profits, GET THE FACTS!

Joining coil sections with torch and solder ring. No threading. No fitting.



"Fin-Tube" panel heating in picture window wall.



Kritzer Radiant Coils in recessed chamber for panel heating.

A finished heating section on Kritzer hangers. Joists furred and ready for lath and plaster.

FOR JOISTS AND STUDS 12"—16" OR 24" O.C.

CONVENIENT LENGTHS

SIMPLE • TIME-SAVING DOLLAR-SAVING

A single Kritzer Radiant Coil supplants several lengths of ordinary tubing. These coils are a single 5/8" copper tube with mechanically bonded 1½" x 3" aluminum fins, ¼" apart. Here is efficient heat transfer with first cost the last cost. WRITE TODAY and send the coupon.

IF IT'S KRITZER, IT'S RIGHT SIR

NEW DESCRIPTIVE FOLDER AVAILABLE

KRITZER RADIANT COILS, INC.
2907 West Lawrence Avenue, Chicago 25, Illinois

Gentlemen: I'm interested. Please send complete information and bulletin on KRITZER "Fin-Tube" Radiant Coils.

Name_____

Firm_____

Address_____

City_____ Zone_____ State_____

For more information on products advertised, use Inquiry Card, page 97

TRIANGLE
PILLOW BLOCK

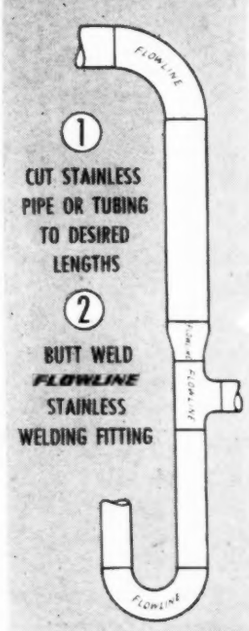
SHOCK-ABSORBING BUILT-IN CUSHIONS

- For fans, blowers and other devices requiring self-lubrication, perfect alignment, silent operation—with minimum attention.
- Low prices include built-in, non-hardening synthetic rubber cushions. It's ALL in the ball—no extra parts to buy or handle!

SPECIAL MOUNTINGS DESIGNED TO MEET SPECIFIC NEEDS

Triangle Bridge-Tree Type Pillow Block

TRIANGLE MANUFACTURING CO.
396 DIVISION STREET OSHKOSH, WISCONSIN



SIMPLIFIED *Stainless* FABRICATION
with *FLOWLINE* Trade Mark
STAINLESS WELDING FITTINGS

Any stainless steel piping system can be constructed with a minimum of equipment, using *FLOWLINE* stainless steel welding fittings, simply by straight cutting of tubes to desired lengths and plain butt welding. Fitting and welding time is thereby reduced, and a cleaner, lastingly efficient system is assured, since pockets and sharp corners that cause pressure drop are eliminated. *FLOWLINE* fittings can be cut out of the line and used again.

FLOWLINE stainless welding fittings are made in Stainless Types 304, 316, and 347; to match pipe and tubing of various wall thicknesses in sizes from ¾" through 12". Send for Bulletin S-310 which gives complete specifications and list prices of the world's most complete line of stainless steel welding fittings.

WELDING FITTINGS CORP.
NEW CASTLE, PENNSYLVANIA
Formerly Stainless Alloy Division - Pittsburgh Piping and Equipment Co.

World's Largest Manufacturer of Stainless Steel Welding Fittings

Augur, Jones & Green, 62 LaSalle Road, Hartford, have been appointed representatives for the State of Connecticut by **Anemostat Corp. of America.**

Buyers' Directory Section

In the April HEATING AND VENTILATING, Section 2, Buyers' Directory, two errors appeared, as follows:

American Ventilating Hose Company was incorrectly listed as making metal flexible hose. The listing should have been for Non-Metallic Hose and Air Hose.

J. F. Pritchard & Co. was omitted from the Cooling Towers (mechanical and natural draft) listings, where they should have appeared.

INDUSTRIAL DEGREE-DAYS
March, 1950

City	55F Base	45F Base
Baltimore, Md.	435	165
Buffalo, N. Y.	823	522
Chicago, Ill.	655	365
Cleveland, Ohio	684	388
Detroit, Mich.	760	453
Indianapolis, Ind.	567	286
New York, N. Y.	553	262
Philadelphia, Pa.	487	209
Pittsburgh, Pa.	572	286
St. Louis, Mo.	434	191

Canadian Degree-Days for March, 1950*

City	March		Cumulative Sept. 1 to Mar. 31	
	1950	Normal	1949-50	Normal
Calgary, Alta.	1415	1215	8816	7881
Charlottetown, P. E. I.	1314	1203	6858	6869
Crescent Valley, B. C.	970	961	7033	6704
Edmonton, Alta.	1435	1290	9567	8589
Fort William, Ont.	1581	1386	9026	8590
Grande Prairie, Alta.	1569	1339	10045	8795
Halifax, N. S.	1124	1066	5746	6134
London, Ont.	1246	1073	6215	6326
Medicine Hat, Alta.	1246	1150	8457	7588
Moncton, N. B.	1280	1190	7024	7296
Montreal, P. Q.	1352	1265	7077	7373
North Bay, Ont.	1460	1280	8100	7933
Ottawa, Ont	1401	1256	7417	7638
Penticton, B. C.	884	787	6383	5566
Porquis Junction, Ont.	1655	1550	9571	9614
Prince George, B. C.	1190	1091	8766	7768
Quebec City, P. Q.	1370	1311	7485	7999
Regina, Sask.	1618	1504	10137	9641
St. John, N. B.	1203	1132	6446	6784
Saskatoon, Sask.	1550	1445	10350	9356
Toronto, Ont.	1138	1072	5705	6226
Vancouver, B. C.	737	682	5015	4479
Victoria, B. C.	707	651	4555	4065
Windsor, Ont.	1094	995	5497	5872
Winnipeg, Man.	1637	1531	9957	9622

*These data are supplied through the courtesy of the Meteorological Division, Air Service Branch, Department of Transport, Canada.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

FLUID DYNAMICS CONFERENCE—Mid-western conference on fluid dynamics, together with a meeting of the American Physical Society at the University of Illinois, Urbana, Ill., in conjunction with the University's dedication of their new mechanical engineering building. Prof. S. Konzo, College of Engineering, University of Illinois.....**MAY 12-13, 1950.**

MASTER PLUMBERS CONVENTION — 68th annual convention, and 1950 home comfort exposition of the National Association of Master Plumbers, at Civic Auditorium, San Francisco, California. J. L. Sudler, 1105 K Street, N.W., Washington 5, D. C. .....**MAY 17-20, 1950.**

SMOKE PREVENTION CONFERENCE—Annual conference of the Smoke Prevention Association of America, at the Mt. Royal Hotel, Montreal, Canada. D. A. Sullivan, public relations director of Association, 72 W. Adams St., Chicago 90, Ill. .....**MAY 21-25, 1950.**

NDHA MEETING — 41st annual meeting, National District Heating Association, at Grove Park Inn, Asheville, N. C. John F. Collins, Jr., secretary of Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. .....**MAY 23-26, 1950.**

GAS APPLIANCE MEETING—Annual convention of the Gas Appliance Manufacturers Association, at The Greenbrier Hotel, White Sulphur Springs, W. Va. H. Leigh Whitelaw, managing director, 60 E. 42nd St., New York, N. Y. ..**MAY 25-26, 1950.**

REFRIGERATION EXHIBIT—1950 Midwest Refrigeration and Air Conditioning Educational Exhibit and Conference, sponsored by Refrigeration Equipment Manufacturers Association and the Refrigeration Service Engineers Society, at the New Hotel Jefferson, St. Louis, Mo. Public Relations Department, REMA, 1346 Connecticut Ave., N.W., Washington 6, D. C. .....**MAY 26-28, 1950.**

ASRE MEETING—Spring convention of the American Society of Refrigerating Engineers, at Hotel Muehlebach, Kansas City, Mo. M. C. Turpin, secretary, 40 W. 40th St., New York 18, N. Y. .....**JUNE 4-7, 1950.**

AUTOMOTIVE ENGINEERS MEETING — Summer meeting, Society of Automotive Engineers, at French Lick Springs Hotel, French Lick, Ind. John A. C. Warner, secretary of Society, 29 W. 39th St., New York 18, N. Y. .....**JUNE 4-9, 1950.**

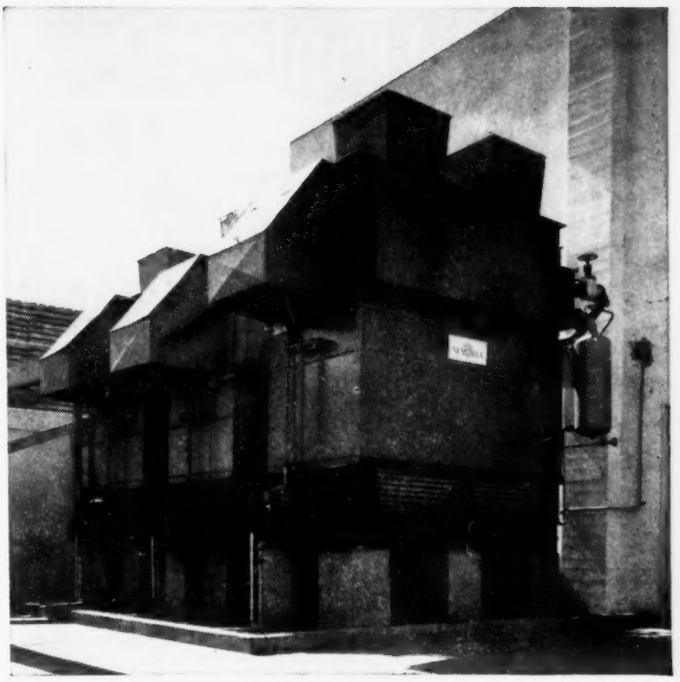
PROFESSIONAL ENGINEERS MEETING — Annual meeting of the National Society of Professional Engineers, at the Hotel Statler, Boston, Mass. Alfred Abboud, chairman publicity committee, c/o E. B. Badger & Sons, Co., 75 Pitts St., Boston 14, Mass. .....**JUNE 8-10, 1950.**

INDUSTRIAL RESEARCH CONFERENCE—Five-day conference on industrial research, conducted by the Department of Industrial Engineering, Columbia University, New York, at the University. Prof. David Bendel Hertz, 409 Engineering, Columbia University, New York 18, N. Y. .....**JUNE 12-16, 1950.**

ELECTRICAL ENGINEERS MEETING—Summer and Pacific general meeting of the American Institute of Electrical Engineers, at Huntingdon Hotel, Pasadena, Calif. Secretary of Institute, 33 West 39th St., New York 18, N. Y. ....**JUNE 12-16, 1950.**

MECHANICAL ENGINEERS MEETING—Meeting of the Oil and Gas Power division of the American Society of Mechanical Engineers, at the Lord Baltimore Hotel, Baltimore, Md. C. E. Davies, secretary of ASME, 29 W. 39th St., New York 18, N. Y. .....**JUNE 12-16, 1950.**

I-B-R SHORT COURSE—Fourth I-B-R short course on steam and hot water heating systems, sponsored by the Institute of Boiler and Radiator Manufacturers, and the University of Illinois, at the University in Champaign-Urbana, Ill. R. K. Newton, supervisor of engineering extension, Room 205, Arcade Bldg., University of Illinois. .....**JUNE 13-16, 1950.**



*PATENTED

New Condenser Cuts Refrigeration Costs Saves Cooling Water

● The Niagara Aeropass Condenser cuts the cost of refrigeration by running compressors at lower head pressure, saving up to 35% of power.

The refrigerant gas passes thru two coils in an air stream. The first, "Duo-Pass"* dry coil, removes the superheat by air cooling and condenses oil vapor. The second, condensing coil, drenched by recirculated water spray, condenses by evaporation, transferring to the air 1,000 BTU for every pound of water evaporated and saving more than 95% of the water used by water-cooled condensers. This done at low temperature, no scale forms on condenser tubes to clog air passage.

Between the two coils is the "Oilout"*, which purges the system of crankcase oil and dirt, keeps it always at full capacity.

The "Balanced Wet Bulb"* control holds head pressure low, automatically giving the full benefits of power saving in cool weather and providing always full capacity for peak loads.

Niagara Aeropass design results from over fifteen years' experience condensing by air. It is completely trustworthy for year' round operation. Users say, "It saves half the difficulties and labor of running a refrigeration plant."

Units range from 10 to 100 tons capacity.
For full information ask for Bulletin 103.

NIAGARA BLOWER COMPANY

Over 35 Years of Service in Industrial Air Engineering

Dept. HV, 405 Lexington Ave., New York 17, N.Y.

District Engineers in Principal Cities

INDUSTRIAL COOLING • HEATING • DRYING
NIAGARA
HUMIDIFYING • AIR ENGINEERING EQUIPMENT

PHILLIPS
FLOAT CONTROLS

PILOT OPERATED LIQUID CONTROL VALVE FOR LARGE EVAPORATORS

701 JR. F.

Leading manufacturers of water chillers use and recommend these valves. The Phillips pilot operated valve responds accurately to a small modulating pilot which may be either a thermostatic or float type expansion valve. They double as a liquid stop valve by use of small solenoid valve in pilot line. Capacities with "Freon" from 20 to 750 tons; Ammonia 30 to 2000 tons. For high or low side applications. WRITE FOR BULLETIN.

A Successful Company built upon the founder's earnest wish to be of service to the Customer and the Industry

H. A. PHILLIPS & CO. - CHICAGO
DESIGNERS AND ENGINEERS REFRIGERATION CONTROL SYSTEMS
3255 W. Carroll Ave. Chicago 24, Ill., U.S.A.

EFFICIENT, LOW COST AIR REMOVER

Muckle VENTS
POWER DRIVEN ROOF EXHAUSTER

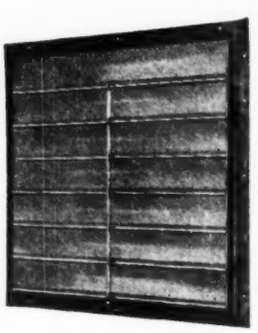
For stores, cafes, bakeries, laundries, garages, etc. Built to function in wet air—motor is out of line of air flow. A compact, sturdy, easy-to-install package unit. Sizes 370 to 13,080 C.F.M. air delivery. Fits any roof. *Write us about YOUR problem.*

MUCKLE MANUFACTURING CO. • OWATONNA 3, MINN.

Elgo Ventilating Specialties

A Marvelous Automatic Shutter

In the first place, the Elgo Automatic Shutter fits more snugly. Secondly, the blades do not flutter—and there are no joints that get loose and rattle. And third, it opens more easily. It is more sensitive to air currents than any other shutter. Sizes from 8" to 72" square —also rectangular.


"ELGO" TYPE AUTOMATIC SHUTTER
Front View (Closed)

Free CATALOG
ELGO SHUTTER & MANUFACTURING CO.
2738 W. Warren Detroit 8, Mich

STOKER MEETING—Annual meeting of the Stoker Manufacturers Association, at the LaSalle Hotel, Chicago. Marc G. Bluth, executive secretary of the Association, 307 No. Michigan Ave., Chicago 1, Ill. ..... **JUNE 15, 1950.**

ASHVE MEETING—1950 semi-annual meeting of the American Society of Heating and Ventilating Engineers, at the Royal Muskoka Hotel, on the Muskoka Lakes, Ontario, Canada. A. V. Hutchinson, secretary of Society, 51 Madison Ave., New York 10, N. Y. ..... **JUNE 18-21, 1950.**

ASME MEETING—Semi-annual meeting of the American Society of Mechanical Engineers, at Hotel Statler, St. Louis, Mo. C. E. Davies, secretary, 29 W. 39th St., New York 18, N. Y. ..... **JUNE 19-23, 1950.**

TESTING MATERIALS MEETING—53rd annual meeting and 9th exhibit of testing apparatus and related equipment, and 7th photographic exhibit, of the American Society for Testing Materials, to be held at Chalfonte-Haddon Hall, Atlantic City, N. J. Robert J. Painter, assistant secretary of the Society, 1916 Race St., Philadelphia 3, Pa. ..... **JUNE 26-30, 1950.**

INSTRUMENT CONFERENCE—5th national instrument conference and exhibit, of The Instrument Society of America, at Memorial Auditorium, Buffalo, N. Y. Richard Rimbach, executive secretary of the Society, 921 Ridge Ave., Pittsburgh 12, Pa. ..... **SEPTEMBER 18-22, 1950.**

INTERNATIONAL ENGINEERING CONGRESS — Third International Mechanical Engineering Congress, sponsored by The British Engineers' Association, to be held in Brussels, Belgium. A. W. Berry, Director of Association, 32 Victoria St., London, S.W. 1, England. ..... **SEPTEMBER 18-23, 1950.**

PETROLEUM CONFERENCE—Petroleum Mechanical Engineering Conference, at Hotel Roosevelt, New Orleans, La. Secretary, American Petroleum Institute, 50 W. 50th St., New York, N. Y. ..... **SEPTEMBER 25-27, 1950.**

AGA CONVENTION AND EXPOSITION—Biennial Exposition of Gas Appliances and Equipment, in conjunction with 1950 annual convention of the American Gas Association, at Convention Hall, Atlantic City, N. J. Secretary, AGA, 420 Lexington Avenue, New York 17, N. Y., and secretary, Gas Appliance Manufacturers Association, 60 E. 42nd St., New York 17, N. Y. ..... **OCTOBER 2-6, 1950.**

METALS MEETING—Annual meeting of the American Society for Metals, in Chicago, Ill. For hotel and other details, write W. H. Eisenman, national secretary, 7301 Euclid Ave., Cleveland 3, Ohio. ..... **OCTOBER 23-27, 1950.**

WELDING MEETING—Annual meeting of the American Welding Society, in Chicago, Ill. For hotel and other details, write J. G. Magrath, national secretary, 33 W. 39th St., New York 18, N. Y. ..... **OCTOBER 23-27, 1950.**

REFRIGERATION WEST COAST EXHIBIT—West Coast Educational Exhibit and Conference, of the Refrigeration Equipment Manufacturers Association, at Municipal Auditorium in Long Beach, Calif., to be held simultaneously with 5th annual convention of the Refrigeration & Air Conditioning Contractors Association. Edna Berggren, executive secretary, 228 No. La Salle St., Chicago 1, Ill. ..... **NOVEMBER 17-19, 1950.**

ASRE MEETING—Annual convention of the American Society of Refrigerating Engineers, at Hotel Commodore, New York. M. C. Turpin, secretary, 40 W. 40th St., New York 18, N. Y. ..... **DECEMBER 3-6, 1950.**

BUILDING RESEARCH CONGRESS—A Congress on Building Research, to be held during the Festival of Britain, in London, England. Organizing secretary, Building Research Station, Bucknalls Lane, Garston, Watford, Herts, England. ..... **SEPTEMBER 11-20, 1951.**

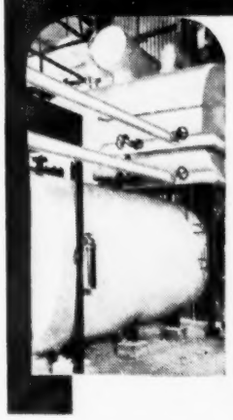
REFRIGERATION SHOW—7th All-Industry Refrigeration and Air Conditioning Exposition, at Navy Pier, Chicago, Ill. Show director, REMA, 1346 Connecticut Ave., N.W., Washington, D. C. ..... **NOVEMBER 5-9, 1951.**

ORIGINATORS OF
ELECTRONIC
CONTROLS FOR HEATING SYSTEMS

AU-TEMP-CO

MOTORIZED VALVES
INDOOR-OUTDOOR TEMPERATURE CONTROLS
Au-Temp-Co Corp., 521-5th Ave., N.Y.C.

HERE'S YOUR COVER FINISH



No need to sew covers onto insulation. Cementing saves time, costs less. Arabol Lagging Adhesive—developed for war needs—now meets all requirements on installations of all sizes. Easily applied, dries quickly, requires no painting. Write for Bulletin #14.

THE ARABOL MANUFACTURING CO.
110 East 42nd St., New York 17, N. Y.
1835 S. 54th Ave., Chicago 50, Ill.
1950 16th St., San Francisco 3, Cal.

Adhesives?... ARABOL!

SMALL IN SIZE

Solenoid
STAINLESS STEEL
Valves

LARGE IN CAPACITY

THREE WAY-Two Position-Normally Closed-Normally Open-Directional Flow
TWO WAY-Normally Closed
TWO WAY-Normally Open

Skinner Solenoid Valves are extremely compact yet have unusual capacity—a great asset to designers looking for positive, accurate, long-lived controls for liquid and gaseous media. Available in standard pressure range of 5 to 250 p.s.i. and special from 5 to 850 p.s.i. Impregnated coils withstand moisture. Soft insert seats prevent leakage. Spring loaded for positive action. Usable in any position. Power consumption of 10 watts max. Pipe connections available to your specifications.

Write for Bulletin No. 491

Skinner ELECTRIC VALVE DIV.
THE SKINNER CHUCK COMPANY
136 Belden Ave., Norwalk, Conn.

CLASSIFIED ADVERTISING

Non-display advertisements 10 cents a word per insertion. (No charge for name and address.) Minimum charge $2.00. Payable in advance.

Manufacturer's Agents

Nationally known AAA home heating equipment manufacturer with spectacular development in this field seeks services of qualified, experienced manufacturer's agents, with record of sales and ability, contacts and known to the trade, in the following territories: Mid-West, Southeast, and North Atlantic states. Men who presently represent lines in the heating and building trade preferred.

In reply give details as to companies, products previously and presently represented, record of sales and territory covered, together with recent photograph.

Our organization knows of this advertisement. Reply Box No. 698, HEATING and VENTILATING, 148 Lafayette Street, New York 13, N. Y.

ASSOCIATE SALES MANAGER to assist manufacturers' representative covering Conn., Western Massachusetts. Lines include air conditioning, heating, ventilating equipment of nationally known manufacturers. Excellent opportunity for young engineer. Box No. 703, HEATING and VENTILATING, 148 Lafayette Street, New York 13, N. Y.

WANTED — ASSISTANT TO EXECUTIVE SECRETARY—Should be an engineer with editorial ability—Age 25 to 35—Apply in writing, giving details of education and experience to A. V. Hutchinson, Executive Secretary, A.S.H.V.E., 51 Madison Avenue, New York 10, N. Y.

ALL-WEATHER ALUMINUM HOLDERS All sizes for truck meter tickets. Keep drivers' tickets clean. Send sample of your ticket and we will furnish proper size holder. DEGREE-DAY SYSTEMS, WOODSIDE, N. Y.

CONSULTING ENGINEER wants graduate engineer, mechanical or electrical, graduate of Carrier or York factory training school in application with enough field experience to be practical-minded and enough understanding of scope of work to know he has much to learn: as junior engineer with future dependent upon his production: to be 100% engineer, good draftsman and like it: single man preferred: complete details, photo, availability, salary record and asking salary in first letter: midwest city. Box 704, HEATING and VENTILATING, 148 Lafayette Street, New York 13, N. Y.

WANTED—FACTORY REPRESENTATIVES —To call on manufacturers of gas appliances —Water Heaters, Space Heating, Cooking. Territories East of Mississippi. Product: Diaphragm valves, gas and electric operated, gas pressure regulators. Please give full details in first letter. PACIFIC SPECIALTY MFG. CO., 700 So. Palm Ave., Alhambra, Calif.

THREE (3) EXPERIENCED ENGINEERS desired for permanent employment in office of Consulting Engineers to handle design of one or more of the following: air conditioning, heating, refrigeration, plumbing. Send complete data on qualifications to: de LAUREAL & MOSES, Consulting Engineers, 302 Nola Building, New Orleans 12, Louisiana.

HEAVY DUTY POWERFUL FURNACE VACUUM CLEANER (no bags needed) only $89.50. Rush check with order—Fully guaranteed. Write for special low prices on oil and gas burners. Hasko Utilities Company, 879 Tenth Avenue, New York 19, N. Y.

Manufacturers' Agent WANTED for Boston and Northern New England

Manufacturer of diversified line of Propeller Fan Ventilating Equipment offers protected territory to Sales Engineering Organization. Agency agreement requires Agent handle no competitive propeller fan line. In reply give full details of organization, engineering qualifications and lines handled. Box No. 695, HEATING and VENTILATING, 148 Lafayette Street, New York 13, N. Y.

WANTED—SALES ENGINEER with at least five years' experience in the sale of retail heating and air conditioning, to manage sales in the largest warm air heating establishment in Fargo, North Dakota. Qualified man will assume full responsibility for sales within a 100-mile radius. Salary commensurate with ability to handle responsibilities of position. Personal interviews will be granted only after receipt of written application giving full details of experience. Address: MOLL'S HEATING SERVICE, 1325 Front Street, Fargo, North Dakota.

ALPHABETICAL INDEX OF ADVERTISERS

A

Acme Industries, Inc. 44
Aerofin Corporation ..... *
Air Conditioning Products Co. 114
Air Devices, Inc. ..... *
Air Filter Corp. 105
Air-Maze Corp. ..... *
Airtherm Mfg. Co. ..... *
Alco Valve Co. 5
Allen-Bradley Co. ..... *
Allen Ventilator Div., Production Planning Co. 115
American Air Filter Co., Inc. 12
American Blower Corp. .....Insert 17
American Radiator & Standard Sanitary Corp. ..... *
American Society of Heating & Ventilating Engineers, The ..... *
American Ventilating Hose Co. ..... *
Anderson, V. D., Co. 107
Anemostat Corp. of America ..... *
Arabol Manufacturing Co. 121
Armstrong Machine Works ..... *
Auer Register Co. 116
Au-Temp-Co Corp. 121
Automatic Burner Corp. ..... *

B

Bell & Gossett Co. ..... *
Bethlehem Steel Co. ..... *
Binks Manufacturing Co. 105
Bishop & Babcock Mfg. Co. 115
Breidert, G. C., Co. 115
Brunner Manufacturing Co. 39
Bryant Heater 43
Buffalo Forge Co. 7
Bundy Tubing Co. ..... *
Bush Manufacturing Co. ..... *
Byers, A. M., Co. 48

C

Canton Stoker Corp. ..... *
Carrier Corp. 42
Chase Brass & Copper Co. 40
Chelsea Fan & Blower Co. 111
Chicago Pump Co. ..... *
Clarage Fan Co. ..... *
Classified Advertisements 121
Cleaver-Brooks Co. ..... *
Committee on Steel Pipe Research ..... *
Connor, W. B., Engineering Corp. 41-45
Continental Steel Corp. 19
Crane Co. 28
Curtis Refrigerating Machine Div. of Curtis Mfg. Co. ..... *

D

Detroit Lubricator Co. 31
Detroit Stoker Co. ..... *
Dollinger Corporation ..... Insert bet. 34-37
Dravo Corporation 10
Dunham, C. A., Co. 30
Durant Insulated Pipe Co. ..... *

E

Elgo Shutter & Mfg. Co. 120
Emerson Electric Manufacturing Co. 38

F

Farr Company 22
Feddors-Quigan Corp. 20-21

G

General Electric Co. ..... *
Grant Wilson, Inc. 24
Grinnell Co., Inc. ..... *

H

Harrington & King Perforating Co. *
Hendrick Manufacturing Co. 111
Henry Valve Co.....Inside Back Cover
Hoffman Specialty Co. ..... *
Hook & Ackerman, Inc. ..... *

I

Illinois Engineering Co., Inc. 32
Illinois Testing Laboratories, Inc. 46
Industrial Press ..... *
Industrial Sound Control..... 116
Infra Insulation, Inc. ..... *

J

Jenkins Bros. ..... *
Johnson Service Co. ..... *
Joy Manufacturing Co. ..... *

K

Kennametal, Inc. 108-109
Kennard Corp. 14
Kewanee Boiler Corp. 18
Kritzer Radiant Coils, Inc. 117

L

Lee Engineering Co. ..... *

M

Marley Company, Inc. 25
Marlo Coil Co. ..... *
Marsh Heating Equipment Co. ..... *
Massachusetts Blower Div., Bishop & Babcock Mfg. Co. 115
McCord Corporation ..... *
McDonnell & Miller, Inc. .....Back Cover
Mercoid Corporation 114
Minneapolis-Honeywell Regulator Co. 13
Modine Manufacturing Co. 34
Muckle Mfg. Co. 120

N

Nash Engineering Co. 50
National Tube Co. ..... *
New York Blower Co. 23
Niagara Blower Co. 117
Nicholson, W. H., & Co. 111
Norge Heat Div. of Borg-Warner Corp. 27

O

Oran Company 116
Owens-Corning Fiberglas Corp. 33

P

Patterson-Kelley Co., Inc. ..... *
Phillips, H. A., & Co. 120
Powers Regulator Co. ..... *
Prat-Daniel Corp., Thermoblock Div. *
Pritchard, J. F., & Co. 107
Pyle-National Co. ..... *

R

Research Products Corp. ..... *
Revere Copper & Brass Inc. 103
Ric-wiL Company.....Inside Front Cover

S

Sall Mountain Co. 37
Sarco Co., Inc. 6
Sarcotherm Controls, Inc. ..... *
Skidmore Corporation ..... *
Skinner Electric Valve Div., The Skinner Chuck Co. 121
Sturtevant Div., Westinghouse Electric Corp. ..... *
Superior Combustion Industries, Inc. *
Swartwout Co. ..... *

T

Taylor Forge & Pipe Works ..... *
Thrush, H. A., & Co. 26
Titusville Iron Wks. Co. ..... *
Todd Shipyards Corp. ..... *
Trane Co. 8
Triangle Mfg. Co. 118
Tube Turns, Inc. 112-113
Tuttle & Bailey, Inc. 9
Typhoon Air Conditioning Co., Inc. *

U

United States Air Conditioning Corp. 1
United States Steel Corp. ..... *

W

Wagner Electric Corp. ..... *
Want Advertisements 121
Webster, Warren, & Co. 2
Welding Fittings Corp. 118
Westinghouse Electric Corp., Sturtevant Div. ..... *
Wilson, Grant, Inc. 24
Wing, L. J., Mfg. Co. 15
Wolverine Tube Div., Calumet & Hecla Consolidated Copper Co., Inc. 29

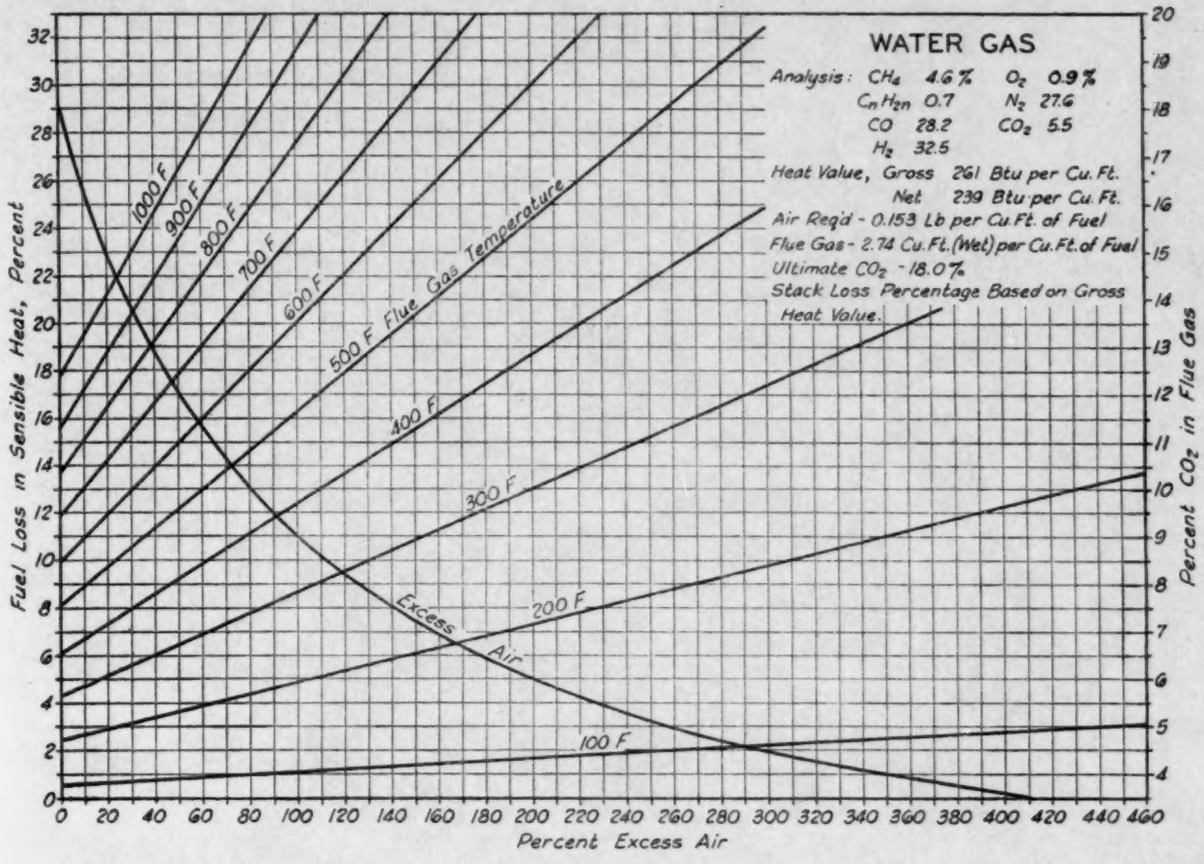
Y

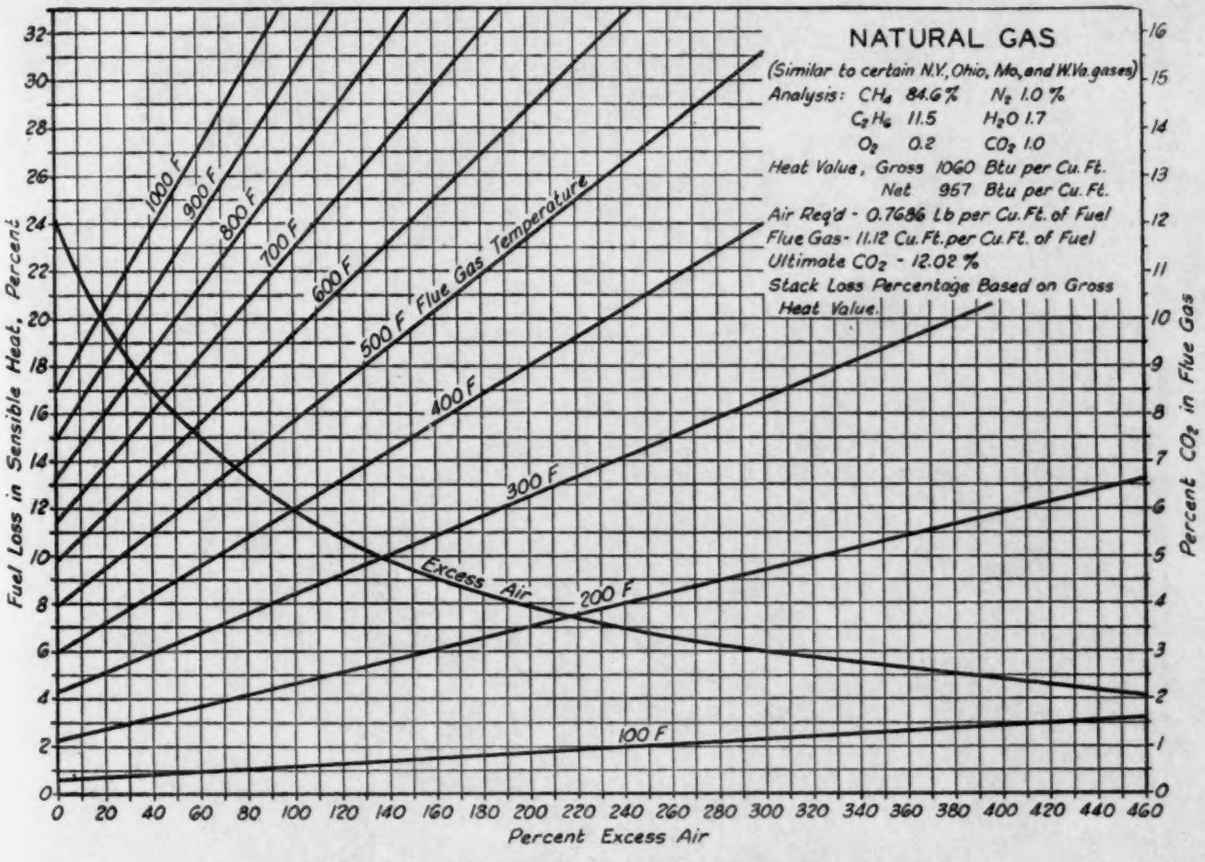
Yarnall-Waring Co. 11
York Corporation 16
Young Radiator Co. ..... *
Youngstown Sheet & Tube Co. 4

*Advertisement appeared in preceding issue.

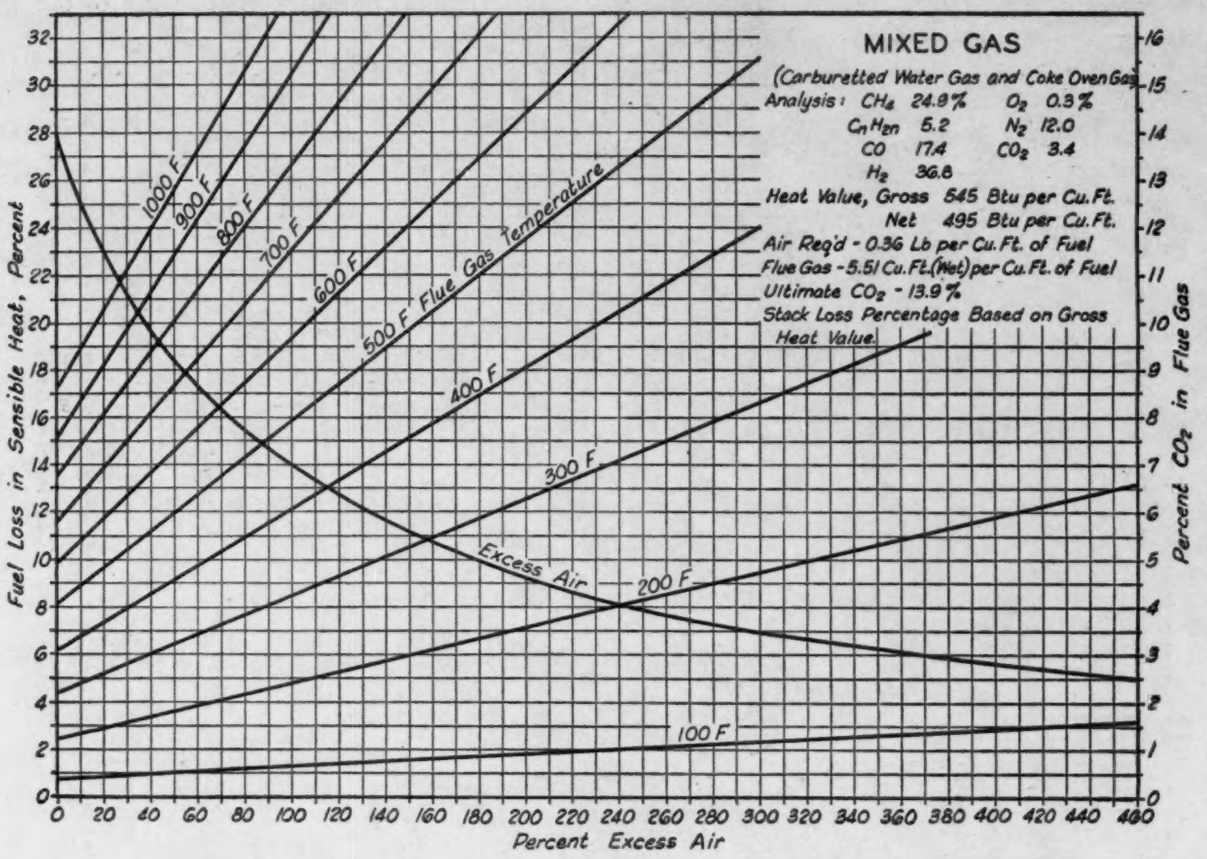
SENSIBLE HEAT LOSS IN FLUE GAS—WATER AND NATURAL GAS

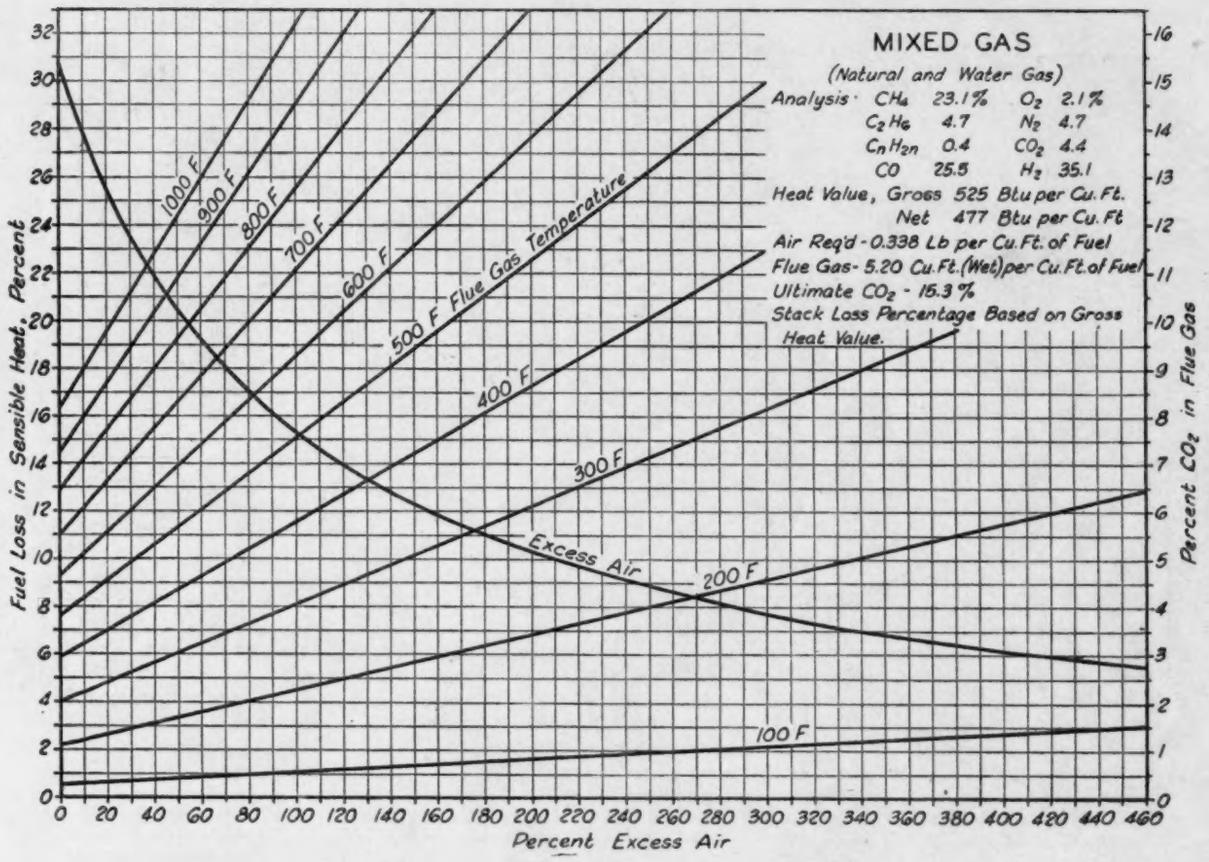
The accompanying charts are for determining the amount of excess air and the percent of sensible heat loss in the flue gas knowing the percent of CO_2 in the flue gas. The use of the charts is as described in the February, 1949 data sheet.


WATER GAS
Analysis: CH_4 4.6% O_2 0.9%
C_nH_{2n} 0.7 N_2 27.6
CO 28.2 CO_2 5.5
H_2 32.5
Heat Value, Gross 261 Btu per Cu. Ft.
Net 239 Btu per Cu. Ft.
Air Req'd - 0.153 Lb per Cu. Ft. of Fuel
Flue Gas - 2.74 Cu. Ft. (Wet) per Cu. Ft. of Fuel
Ultimate CO_2 - 18.0%
Stack Loss Percentage Based on Gross Heat Value.
1000 F
900 F
800 F
700 F
600 F
500 F Flue Gas Temperature
400 F
300 F
200 F
100 F
Excess Air
Fuel Loss in Sensible Heat, Percent
Percent CO_2 in Flue Gas
Percent Excess Air


NATURAL GAS
(Similar to certain N.Y., Ohio, Mo, and W.Va. gases)
Analysis: CH_4 84.6% N_2 1.0%
C_2H_6 11.5 H_2O 1.7
O_2 0.2 CO_2 1.0
Heat Value, Gross 1060 Btu per Cu. Ft.
Net 957 Btu per Cu. Ft.
Air Req'd - 0.7686 Lb per Cu. Ft. of Fuel
Flue Gas - 11.12 Cu. Ft. per Cu. Ft. of Fuel
Ultimate CO_2 - 12.02%
Stack Loss Percentage Based on Gross Heat Value.
1000 F
900 F
800 F
700 F
600 F
500 F Flue Gas Temperature
400 F
300 F
200 F
100 F
Excess Air
Fuel Loss in Sensible Heat, Percent
Percent CO_2 in Flue Gas
Percent Excess Air

HEAT LOSS IN FLUE GAS — MIXED GASES


MIXED GAS
(Carburetted Water Gas and Coke Oven Gas)
Analysis: CH_4 24.9% O_2 0.3%
C_nH_{2n} 5.2 N_2 12.0
CO 17.4 CO_2 3.4
H_2 36.8
Heat Value, Gross 545 Btu per Cu. Ft.
Net 495 Btu per Cu. Ft.
Air Req'd - 0.36 Lb per Cu. Ft. of Fuel
Flue Gas - 5.51 Cu. Ft. (Wet) per Cu. Ft. of Fuel
Ultimate CO_2 - 13.9%
Stack Loss Percentage Based on Gross Heat Value.
1000 F
900 F
800 F
700 F
600 F
500 F Flue Gas Temperature
400 F
300 F
200 F
100 F
Excess Air
Fuel Loss in Sensible Heat, Percent
Percent CO_2 in Flue Gas
Percent Excess Air

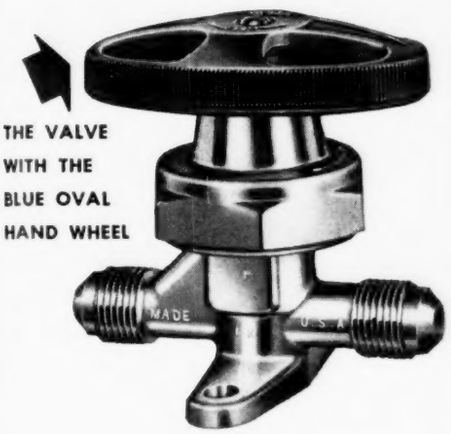

MIXED GAS
(Natural and Water Gas)
Analysis: CH_4 23.1% O_2 2.1%
C_2H_6 4.7 N_2 4.7
C_nH_{2n} 0.4 CO_2 4.4
CO 25.5 H_2 35.1
Heat Value, Gross 525 Btu per Cu. Ft.
Net 477 Btu per Cu. Ft
Air Req'd - 0.338 Lb per Cu. Ft. of Fuel
Flue Gas - 5.20 Cu. Ft. (Wet) per Cu. Ft. of Fuel
Ultimate CO_2 - 15.3%
Stack Loss Percentage Based on Gross Heat Value.
1000 F
900 F
800 F
700 F
600 F
500 F Flue Gas Temperature
400 F
300 F
200 F
100 F
Excess Air
Fuel Loss in Sensible Heat, Percent
Percent CO_2 in Flue Gas
Percent Excess Air

HENRY

BALANCED-ACTION DIAPHRAGM PACKLESS VALVES

Still the Best Buy...

and First Choice of Contractors and Servicemen Because of these Field-Proven Features

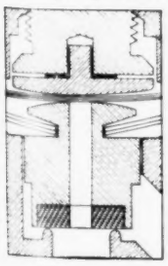


BLUE BANTAM

DIAPHRAGM PACKLESS VALVE

LOWER in Height and LOWER in Price

It contains all the field proven advantages such as Balanced-Action, two-piece upper stem, four laminated diaphragms of dissimilar metals, positive spring action, long-life composition seat disc and easy grip hand wheel.

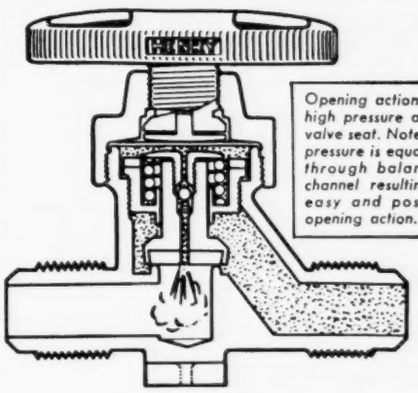


Size Range: ¼" through ⅝" O.D.

Note two-piece upper stem and positive seal between balancing channel and bottom diaphragm while valve is in closed position.

POSITIVE OPERATION

- **A Balanced-Action valve is non-directional.**
- **It cannot stick shut regardless of pressure differential above or below seat.**



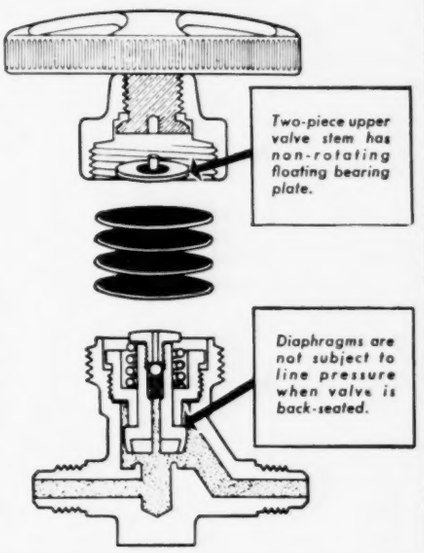
Opening action with high pressure above valve seat. Note how pressure is equalized through balancing channel resulting in easy and positive opening action.

- **Valve will operate even if a high vacuum exists below the seat and there is a high pressure above the seat. This condition is frequently encountered when pumping down or evacuating a part of a system.**

TWO-PIECE UPPER VALVE STEM

For Longer Diaphragm Life

The lower section of the two-piece upper valve stem is a non-rotating floating bearing plate which minimizes torsional wear and strain on diaphragms.



Two-piece upper valve stem has non-rotating floating bearing plate.

Diaphragms are not subject to line pressure when valve is back-seated.

EASY DIAPHRAGM INSPECTION AND REPLACEMENT

When valve is in full open position, lower stem back seats on spring cage. Spring tensioned ball check seals off balancing channel with valve chamber under line pressure permitting access to diaphragms after bonnet is removed.

Complete Size Range for ¼" through 1⅜" O. D. copper tubing

Valves, Driers, Strainers, Control Devices and Accessories for Refrigeration and Air Conditioning and Industrial Applications.

HENRY VALVE CO. CONTROLLING FLOW SINCE 1914

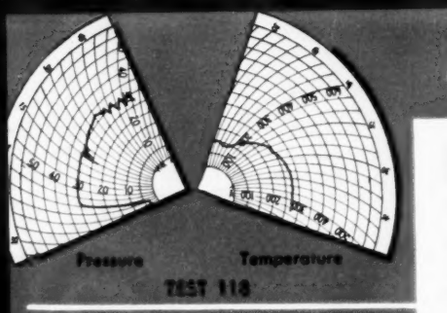
SEE YOUR WHOLESALER

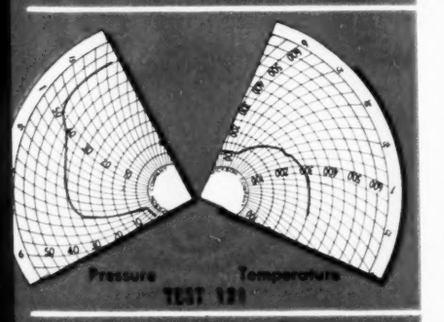
HENRY VALVE CO.

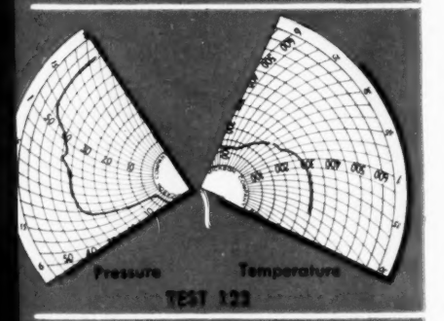
Melrose Park, Ill. (Chicago Suburb)

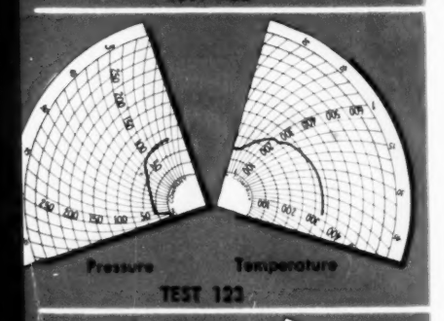
Cable: HEVALCO, MELROSE PARK, ILLINOIS

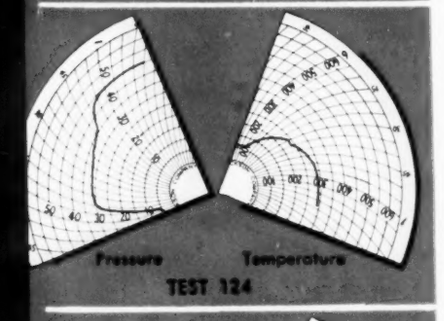
Why use a Btu. rated Relief Valve

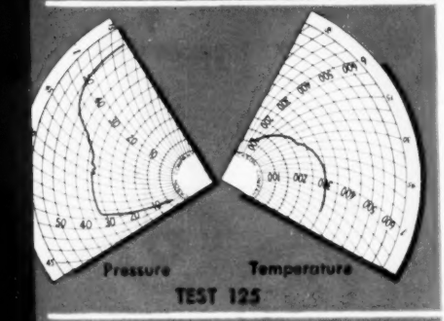


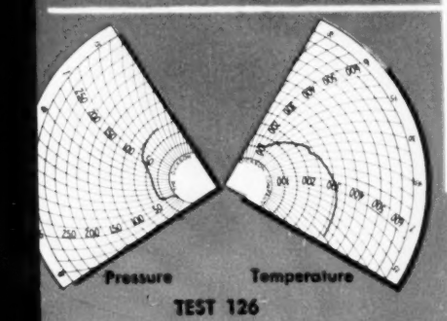












Here is the answer under actual operating condi

That section of the current A.S.M.E. boiler code bearing directly on the testing and rating of relief valves for hot water heating boilers reads in part:

"Relief valves for hot-water boilers shall be tested for capacity at 10 per cent over the 30 psi required set pressure . . . These tests shall be conducted in the presence of, and certified by, an authorized observer . . . A data sheet for each valve tested shall be filled out and signed by the authorized observer . . . Such data sheet will be the manufacturer's authority to build and stamp valves of corresponding design and construction . . . The relieving capacity that may be stamped on the valves shall not exceed 90 per cent of the value determined by the witnessed tests."

However, despite this code recommendation, the question is still being asked: "Is a Btu. rated relief valve really necessary?" The test data shown and tabulated here prove that a Btu. rated relief valve is absolutely necessary to prevent over-pressure under *all conditions** that can arise in hot water heating boiler operation.

Why and how the test was made —

The purpose of this test was to compare the pressure (and temperature) developed in a boiler under the same operating co but with two kinds of valves:—

(1) Equipped with Btu. rated relie capable of dissipating the ma heat output of the boiler.

(2) Equipped with non-rated relie

For the rated valve test we chose McDonnell No. 33, which was teste National Board of Boiler and Pressur Inspectors to comply with the A.S.M. code, and is rated (on its namep 242,900 Btu. per hour. The test on th was made as severe as possible — at output of 243,000 Btu. per hour, i mum rated capacity.

To make the non-rated valve test representative we chose, not one, bu of the popular makes of non-rated These were tested at the same heat o the rated valve—243,000 Btu. per hou these valves were purchased new fro go stocks during July of this year.

The recorder charts related to the reproduced opposite. Test and phys are as follows:

(1) TEST OF RATED VALVE

Test No.	Manufacturer	Type No.	Test Data: Boiler Output Btu. per hr.	Test Data: Max. Pres. lbs.	Test Data: Max. Temp. Deg. F.	Physical Data: Inlet	Physical Data: Outlet	Physical Data: Orifice Diam.	
118	McDonnell & Miller	No. 33	243,000	33	275	¾"	1"	7/16"	

(2) TESTS OF NON-RATED VALVES

121	A	—	243,000	50	296	¾"	¾"	9/16"	Co
122	B	—	243,000	50.5	297	½"	½"	7/16"	Co
123	C	—	243,000	80	324	½"	½"	15/32"	Co
124	E	—	243,000	45	290	½"	½"	7/16"	Co
125	F	—	243,000	52	300	¾"	¾"	3/8"	Co
126	D	—	243,000	76	321	½"	½"	15/32"	Co

Yes, only the McDonnell No. 33 held pressure within the maximum of 33 psi covered by the Code (10% over the 30 psi required set pressure.) All others exceeded it; many of them far ex

An interesting side-light on the test is found in the fact that the McDonnell No. 33 is the first Btu. rated and labelled safety relief valve to be priced within the reach of every boiler owner. As the test shows, it will prevent over-pressure on any hot water boiler having a heat output equal to or less than its rated capacity of 242,900 Btu. per hour—approximately 70% of them according to I.B.R. records of 1948 boiler shipments.

Notice that despite its moderate price t is the only valve tested having metal-to-m ing.† This means leak-tight closure; free deformation, sticking, etc. Other features stage discharge—low rate for thermal e high rate for emergency; independent testing lever; neat compact design. Ask fo

McDONNELL & MILLER, INC., 1313 Wrigley Bldg., Chicago 11, Ill.

Doing One Thing Well

*Yes, *ALL* conditions. Good engineering accepts no unnecessary risks. Yet strangely enough, homeowners are often asked to run risks that industry, which follows code recommendations to the letter, would refuse to accept.

Obviously the code makers, in recommending rated relief valves for hot water heating boilers, proceeded on the only sound engineering basis of accepting no unnecessary risks. On this basis—on the basis of anticipating every possible emergency—the only means of preventing the over-pressure attendant to such an emergency is to provide a means of dissipating the maximum heat output of the boiler.

Make no mistake about it: This requirement can be fulfilled only by a Btu. rated relief valve properly matched to the boiler on which it is installed.

† In this connection it is interesting to note that a bulletin, dated April 30, 1948, and entitled "Hot Water Pressure Relief Device Test Conducted by the National Board of Boiler and Pressure Vessel Inspectors at Ohio State University" contains this significant paragraph:

"The fact that composition discs can become deformed or can change shape during tests introduces a variable in the opening area through a relief valve, making it practically impossible to measure the area of opening in a relief valve, which means that a coefficient of discharge as based on flow formula cannot be determined."

McDONNELL NO. 33
SAFETY RELIEF VALVE

HNOLOGY DEPT.

JUNE, 1950

HEATING AND VENTILATING

INCLUDING AIR CONDITIONING – PIPING – REFRIGERATION – AIR SANITATION

Packaged Units for Air Conditioning Retail Stores Page 75

Laboratory Cooling Loads . . page 69

Short Center V-Belt Drives . . page 73

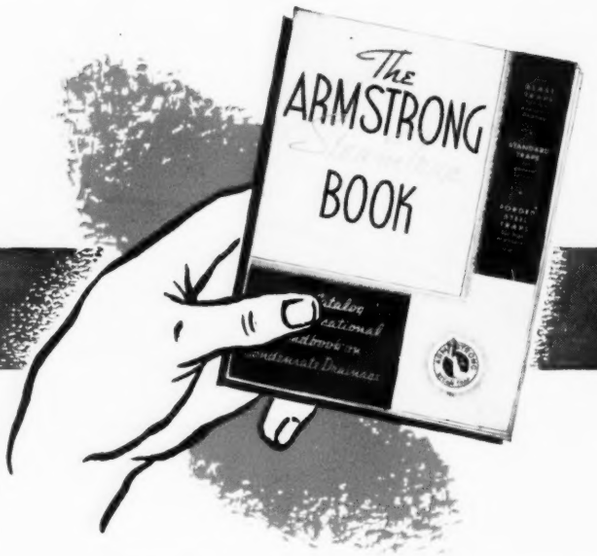
A Portable Smoke Recorder . page 87

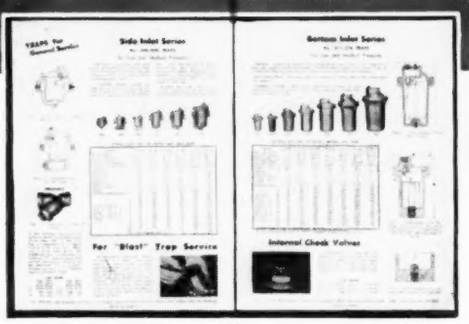
Supports for Piping . page 92

Table of Contents . . . page 3

"You can engineer any trapping job with this book"

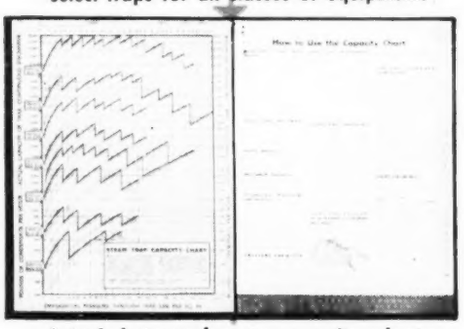
YOU CAN'T GO WRONG





Physical data and prices on all sizes and types of Armstrong steam traps.

How to calculate condensate loads and select traps for all classes of equipment.



Actual hot condensate capacity chart for every Armstrong trap, recommended safety factors and specific recommendations for many types of equipment.

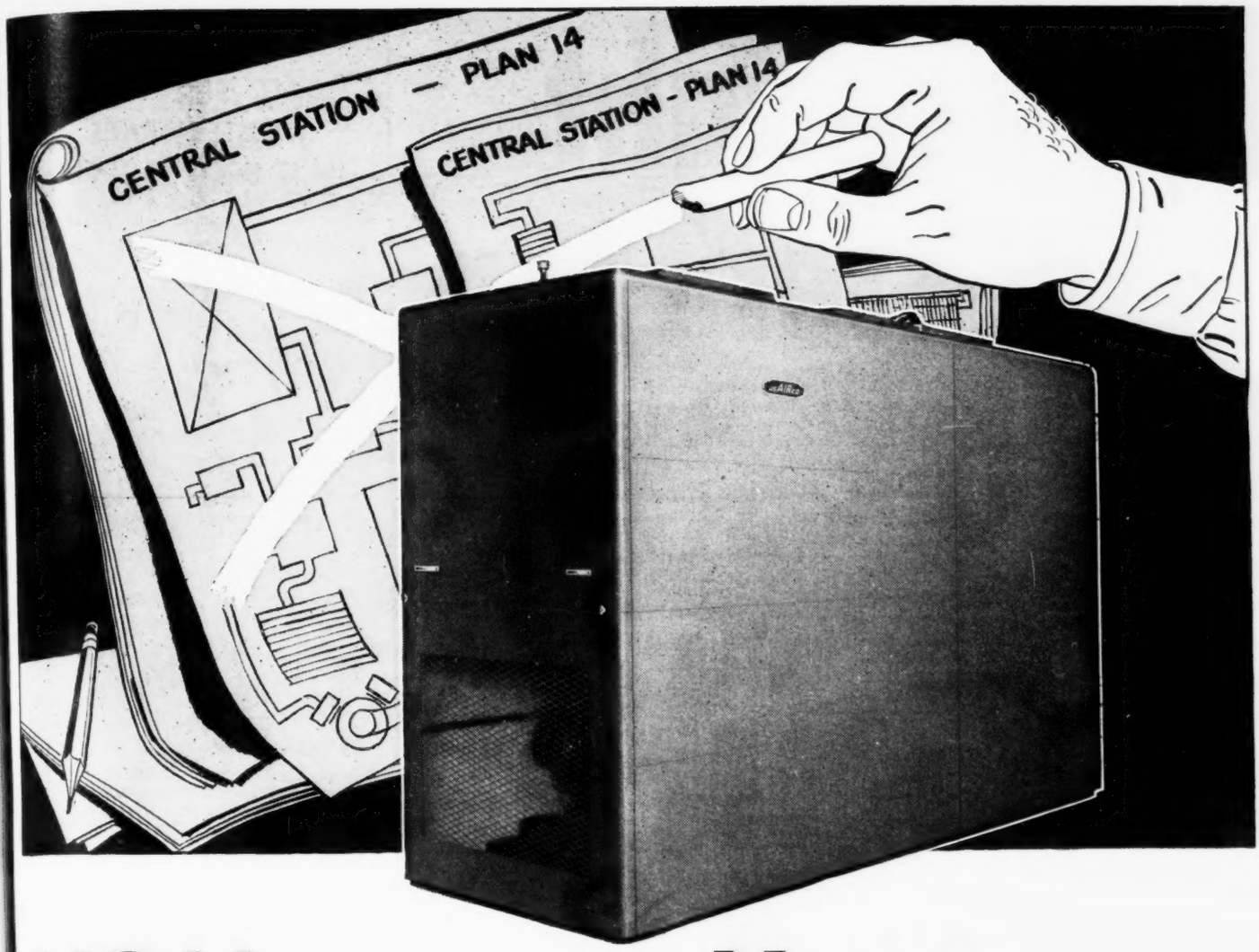
THERE is no guess work about steam traps or steam trap selection when you have the 36-page Armstrong Steam Trap Book to work with. You don't waste money on traps that are too big for the job. You don't get inefficient drainage with traps that are too small.

This book explains the design, operation and advantages of Armstrong steam traps, specifies materials used, gives complete dimensional data, includes list prices, actual capacities under working conditions. There are 10 pages of tabular and technical data explaining how to calculate condensate loads and select the correct trap for the job, complete instructions on installation and maintenance. The Steam Trap Book also describes Armstrong traps for draining moisture from compressed air systems, Armstrong steam humidifiers for adding moisture to dry air and Armstrong non-condensable gas purgers for removing air from refrigeration systems.

Anyone is welcome to a copy of this useful guide to good trapping practice. Send for yours today.

ARMSTRONG MACHINE WORKS
846 Maple St., Three Rivers, Mich.

ARMSTRONG STEAM TRAPS



YOU MARK THE X AND SPOT YOURSELF A PROFIT!

When you've reached the point where you specify Packaged Refrigerated Air Conditioning in place of Conventional Central Station installation, you've taken a step in the direction of greater profit for yourself, greater satisfaction for your customer.

Now, go all the way, specify USAIRCO Refrigerated Kooler-aire and you put Packaged Air Conditioning at its best to work for you.

In USAIRCO Refrigerated Kooler-aire all the parts of the central station system are brought together into one compact unit requiring only 3 connections: water and drain, power and duct system. A size for every need from 3 to 40 ton capacities.

Prideful ownership and profitable operation assure you the commendation that builds clientele, profitable merchandising makes it worth your while. You'll want to know more about the profit picture so mail the coupon below. United States Air Conditioning Corporation, Minneapolis 14, Minnesota.

USAIRCO

United States Air Conditioning Corporation
3362 Como Ave. S. E., Minneapolis 14, Minn.

Send me the complete story on Refrigerated Kooler-aire.

Name_____

Address_____

City_____ Zone____ State_____

Engineers and manufacturers of air conditioning, refrigeration, unit heaters, coils and ventilating equipment